# MAINE DEPARTMENT OF TRANSPORTATION BRIDGE PROGRAM GEOTECHNICAL SECTION AUGUSTA, MAINE

# GEOTECHNICAL DESIGN REPORT

For the Replacement of:

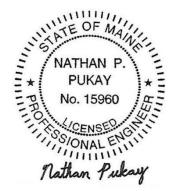
# LITTLE TOMAH BRIDGE STATE ROUTE 6 OVER LITTLE TOMAH STREAM CODYVILLE TOWNSHIP, MAINE



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Washington County WIN 25387.00

Soils Report 2024-18 Bridge No. 2472

# **Table of Contents**

1.0	INTRODUCTION	1
2.0	GEOLOGIC SETTING	1
3.0	SUBSURFACE INVESTIGATION	2
4.0	LABORATORY TESTING	2
5.0	SUBSURFACE CONDITIONS	3
5.1	Fill	3
5.2	MARSH DEPOSITS	
5.3	GLACIAL TILL	4
5.4	Bedrock	4
5.5	Groundwater	5
6.0	FOUNDATION ALTERNATIVES	6
7.0	GEOTECHNICAL DESIGN CONSIDERATIONS AND	
RECO	OMMENDATIONS	6
7.1	INTEGRAL ABUTMENT ROCK-SOCKETED H-PILES	6
7.1.		
7.1.	2 AXIAL PILE RESISTANCE – SERVICE AND EXTREME LIMIT STATE	8
7.1.	3 LATERAL PILE RESISTANCE/BEHAVIOR	8
7.1.	1 ROCK-SOCKETED PILE QUALITY CONTROL	8
7.1.		
7.2	INTEGRAL ABUTMENT AND WINGWALL DESIGN	
7.3	ABUTMENT SECTIONS	
7.4	SETTLEMENT AND EMBANKMENT STABILITY	
7.5	Frost Protection	
7.6	SEISMIC DESIGN CONSIDERATIONS	11
8.0	CONSTRUCTION RECOMMENDATIONS AND CONSIDERATIONS.	12
9.0	CLOSURE	12

# Sheets

Sheet 1 – Location Map

Sheet 2 – Boring Location Plan

Sheet 3 – Interpretive Subsurface Profile

Sheet 4 – Boring Logs

Sheet 5 – Boring Logs

# Appendices

Appendix A – Boring Logs

Appendix B – Rock Core Photographs

Appendix C – Laboratory Test Results

Appendix D – Calculations Appendix E – References

## 1.0 Introduction

The purpose of this Geotechnical Design Report is to present subsurface information and provide geotechnical design recommendations for the replacement of Little Tomah Bridge which carries State Route 6 over Little Tomah Stream in Codyville Township, Maine. This report presents the subsurface information obtained at the site during the subsurface investigation, geotechnical design recommendations, and construction recommendations for the new substructures.

The existing Little Tomah Bridge was constructed in 1982. The structure consists of a single 19-foot 11-inch span by 12-foot 10-inch rise structural plate pipe arch bearing on 1-foot of granular borrow. The bridge was temporarily closed after a storm on December 11, 2023, caused high water conditions that washed away the roadway gravel above the culvert. The bridge was backfilled, inspected, and reopened a few days later. According to the December 2023 Maine Department of Transportation (MaineDOT) Bridge Inspection Report, the FHWA Sufficiency Rating of the bridge was reduced to a 25.0. The bridge was already scheduled for replacement due to the poor condition of the culvert, but MaineDOT has accelerated the advertise date.

Available as-built drawings indicate previous structures at the bridge include a crib bridge and a concrete deck slab bridge founded on mass concrete abutments.

The proposed replacement structure consists of a 88-foot, single-span bridge founded on rock-socketed, pile-supported integral abutments with in-line wingwalls. MaineDOT has identified steel girders, Press-Brake Formed Tub Girders (PBTG), and precast, prestressed concrete bulb-tee or AASHTO I-beams as suitable superstructure replacement options. The project will be advertised as a "Detail-Build" project to allow the awarded contractor to select the superstructure that is most favorable for project speed and cost efficiency. The awarded contractor will design both the rock-socketed H-pile substructure and the chosen superstructure while adhering to the requirements in the contract documents.

The new Little Tomah Bridge will be located on a horizontal and vertical alignment that will approximately match the existing.

Traffic will be maintained on a temporary detour built on the upstream side of the existing bridge.

# 2.0 GEOLOGIC SETTING

Little Tomah Bridge carries State Route 6 over Little Tomah Stream as shown on Sheet 1 – Location Map.

The Maine Geological Survey (MGS) Surficial Geology Map of the Fredericton Quadrangle, Maine, Open-File No. 87-13 (1987), indicates the surficial soils in the vicinity of the bridge project consist of marsh deposits and glacial till. Marsh deposits consist of peat, muck, silt, and sand. Glacial till is a heterogeneous mixture of sand, silt, clay, and stones deposited by glacial ice.

The MGS Bedrock Geology of the Calais Quadrangle, Maine, Open-File No. 03-97 (2003), maps the bedrock at the site as variably calcareous, Graywacke interbedded with Slate.

## 3.0 SUBSURFACE INVESTIGATION

Five test borings and three bridge probes were drilled to explore subsurface conditions at the site. Borings BB-CLTS-101, -201, -202 were drilled at the location of proposed Abutment No. 1. Borings BB-CLTS-102 and -203, and bridge probe BP-CLTS-204 were drilled at the location of proposed Abutment No. 2. Bridge probes BP-CLTS-103 and BP-CLTS-104 were drilled to confirm the remains of a concrete abutment from a preexisting bridge structure. The borings and bridge probe locations are shown on Sheet 2 – Boring Location Plan.

The 100-series borings and probes were drilled in October 2022 by the MaineDOT Drill Crew. The remaining borings and probes were drilled in January 2024 by S.W. Cole Explorations. Details and sampling methods used, field data obtained, and soil and groundwater conditions encountered are presented in the boring logs provided in Appendix A – Boring Logs and on Sheets 4 and 5 – Boring Logs.

Bridge probes were performed by advancing a solid stem auger to refusal. Borings were performed by using a combination of solid stem auger, cased wash boring and rock coring techniques. Soil samples were typically obtained at 5-foot intervals using Standard Penetration Test (SPT) methods. During SPT sampling, the sampler is driven 24 inches and the hammer blows for each 6-inch interval of penetration are recorded. The sum of the blows for the second and third intervals is the N-value, or standard penetration resistance. The drill rigs used in the subsurface investigation were equipped with automatic hammers to drive the split spoon. The hammers were calibrated per ASTM D 4633 "Standard Test Method for Energy Measurement for Dynamic Penetrometers" to establish hammer efficiency factors. All N-values discussed in this report are corrected N-values computed by applying the hammer efficiency factors. The hammer efficiency factors and both the raw field N-value and corrected N-value (N<sub>60</sub>) are shown on the boring logs.

Bedrock was cored in the borings using NQ-2" core barrels and the Rock Quality Designation (RQD) of the cores calculated. The MaineDOT geotechnical engineer selected the boring locations and drilling methods, designated type and depth of sampling techniques, identified field-testing requirements, and logged the subsurface conditions encountered in the borings. The borings were located in the field using taped measurements at the completion of the drilling program and then located by MaineDOT Survey.

#### 4.0 LABORATORY TESTING

A laboratory testing program was conducted on selected soil and bedrock core samples recovered from the test borings to assist in soil classification, evaluation of engineering properties of the soil and bedrock, and geologic assessment of the project site. Laboratory testing on soil samples consisted of four standard grain size analyses with natural water content, two grain size analyses with hydrometer and natural water content, one Atterberg limit test, one pH test, and one electrical resistivity test. Two bedrock core samples were tested for compressive strength and elastic moduli.

Soil laboratory testing was performed at the MaineDOT Lab in Bangor, Maine with exception of the pH test and electrical resistivity test, which was performed by GeoTesting Express (GTX) of Acton, Massachusetts. GTX performed all testing on the rock core samples. The results of soil and rock tests are included in Appendix C – Laboratory Test Results. Moisture content information and other soil test results are also presented on the boring logs provided in Appendix A – Boring Logs and on Sheets 4 and 5 – Boring Logs.

## 5.0 SUBSURFACE CONDITIONS

Subsurface conditions encountered in the test borings generally consisted of Fill, Marsh Deposits, Glacial Till, and Bedrock. The boring logs are provided in Appendix A – Boring Logs and on Sheets 4 and 5 – Boring Logs. A generalized subsurface profile is shown on Sheet 3 – Interpretive Subsurface Profile. The following paragraphs discuss the subsurface conditions encountered.

#### **5.1** Fill

A layer of Fill was encountered in the test borings. The thickness of the Fill unit encountered was approximately 11 to 17 feet. The fill materials encountered consisted of:

- Brown, SAND, some gravel, little to some silt, trace clay;
- Brown to dark brown, Gravelly SAND, trace to little silt, trace organics;
- Grey-brown, GRAVEL, trace silt; and
- Cobbles.

Corrected SPT N-values in the Fill ranged from 13 to greater than 50 blows per foot (bpf) indicating the material is medium dense to very dense in consistency.

Three grain size analyses performed on samples recovered from the Fill unit indicated the material is classified as A-1-a, A-1-b and A-2-4 under the AASHTO Soil Classification System and SW-SM, SM and SC-SM under the Unified Soil Classification System (USCS). The natural water contents of the samples tested ranged from 5 to 14 percent.

## 5.2 Marsh Deposits

Marsh Deposits were encountered in BB-CLTS-102, -202, and -203 beneath the fill unit. The encountered thickness was approximately 4 to 8 feet. The deposits were variable and consisted of:

- Grey, SILT, some sand, trace clay, trace gravel;
- Brown, Silty SAND, little gravel; and
- PEAT.

One corrected SPT N-value within the Marsh Deposits was less than 2 bpf, and another SPT N-value was 7 bpf, indicating the deposits are very soft to medium stiff in consistency. One grain size analysis conducted on a sample of the deposits indicated the material is classified as A-4 under the AASHTO Soil Classification System and CL under the USCS. The natural water contents of the sample tested was approximately 34 percent.

One pH test conducted on a sample of the Marsh Deposits measured a pH of 5.27. An electrical resistivity test conducted on the same sample measured 1,864 ohm-cm.

One Atterberg limits test was conducted on a sample from the Marsh Deposits and the test indicated it is non-plastic.

#### 5.3 Glacial Till

Glacial Till was encountered in the borings beneath either the Fill or Marsh Deposit. The thickness of the Glacial Till deposit encountered was approximately 2 to 14 feet. The Glacial Till varied from:

- Grey to grey-brown, SAND, some gravel, little to some silt;
- Grey, Sandy GRAVEL, some silt;
- Grey, GRAVEL, some sand, trace to some silt;
- Grey, Gravelly SILT, some sand; and
- Brown, Sandy SILT, little gravel.

One corrected SPT N-value within the fine-grained Glacial Till was greater than 50 bpf indicating the fine-grained Glacial Till is hard in consistency.

Corrected SPT N-values within the coarse-grained Glacial Till ranged from 28 to greater than 50 bpf indicating the deposit is medium dense to very dense in consistency.

Two grain size analyses performed on samples recovered from the deposit resulted in the material being classified as A-1-a and A-1-b under the AASHTO Soil Classification System and GW-GM and SW-SM under the USCS. The natural water contents of the samples tested were approximately 9 and 14 percent.

#### 5.4 Bedrock

Bedrock was encountered and cored in five of the project borings. The table below summarizes borings in which bedrock was cored, the depth to bedrock, corresponding top of bedrock elevations and RQD's.

Boring	Station	Offset (feet)	Approximate Depth to Bedrock (feet)	Approximate Elevation of Bedrock Surface (feet)	RQD (%) (R1, R2, R3)
BB-CLTS-101	11+65.8	7.3 Lt	24.5	245.8	67
BB-CLTS-102	12+33.2	6.9 Rt	35.4	234.2	70, 83
BB-CLTS-201	11+53.9	6.1 Lt	20.0	250.5	69, 33
BB-CLTS-202	11+53.9	7.0 Rt	18.1	252.5	48, 83
BB-CLTS-203	12+43.6	6.2 Lt	18.1	251.3	85, 80, 85

Bedrock at the site consisted of light to dark grey, very fine to medium-grained, slightly calcareous, GRAYWACKE, interbedded with abundant layers of METASILTSTONE and lesser amounts of SLATE, moderately hard, fresh, joints dipping at moderate to steep angles, spaced close to moderately close. The RQD of the bedrock cores ranged from 33 to 85 percent, corresponding to a Rock Quality of poor to good.

Detailed bedrock descriptions and RQD's are provided in Appendix A – Boring Logs and on Sheets 4 and 5 – Boring Logs. Rock core photographs are provided in Appendix B – Rock Core Photographs.

Unconfined compressive strength (UCS) testing was conducted on two samples of bedrock, the results of which are summarized in the following table.

Boring	Depth Below Ground Surface (ft)	Unconfined Compressive Strength (psi)	Young's Modulus, E <sup>1</sup> (ksi)	Unit Weight (pcf)	Rock Type
BB-CLTS-202	21.52-21.87	5,451	4,910	173	Graywacke
BB-CLTS-203	19.25-19.62	23,452	3,220	170	Graywacke

#### 5.5 Groundwater

Groundwater was measured at depths ranging from 11 to 16 feet below the roadway surface upon completion of the borings. Note that water was introduced into the boreholes during drilling operations and the measured levels may not represent stabilized groundwater elevations. Groundwater levels will fluctuate with seasonal changes, precipitation, runoff, river levels and construction activities.

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<sup>&</sup>lt;sup>1</sup> The Young's Modulus values listed in the table are reported at the initial failure or peak stress range. Reference the test reports in Appendix C – Laboratory Test Results for Young's Moduli reported at other stress ranges.

## **6.0** FOUNDATION ALTERNATIVES

Integral abutments founded on H-pile was the preferred substructure design due to cost, ease of construction, and reduced maintenance costs. Preliminary borings were drilled considering a shorter bridge span prior to the inclusion of wildlife shelves in the bridge design. Driven H-piles were anticipated at Abutment No. 2 until final borings indicated that pile at both abutments would need to be rock-socketed.

## 7.0 GEOTECHNICAL DESIGN CONSIDERATIONS AND RECOMMENDATIONS

The following sections provide geotechnical design considerations and recommendations for rock-socketed H-pile supported integral abutments which is the proposed substructure type for the Little Tomah Bridge replacement project.

# 7.1 Integral Abutment Rock-Socketed H-Piles

Abutments No. 1 and 2 will be integral abutments founded on a single row of rock-socketed H-piles. A minimum of 4 H-piles will be installed at each abutment.

Piles will be sized depending on the factored design axial loads, bending stresses and ability to resist lateral loads. H-piles shall be 50 ksi, Grade A572 steel. The selected pile section shall comply with the slenderness requirements of AASHTO LRFD Bridge Design Specifications 9<sup>th</sup> Edition (LRFD) Article 6.9.4.2 or alternatively, slender pile sections can be accounted for in the design process. The piles shall be fitted with a steel bearing plate sized to provide the required compressive resistance.

The minimum rock socket diameter will be 30-inch. The rock socket design will include a minimum 6-inch grout base beneath the pile bearing plate and a minimum 3-foot grout column encapsulating the bottom of the H-pile. The design shall allow for a minimum of 10-foot free length when measured from the bottom of the abutment stem to the top of the grout column. Lateral pile analyses may dictate the need for a longer free length to control bending stresses.

Estimated distances from the proposed bottom of abutment elevations to the top of rock are provided in the table below. Actual bedrock conditions may vary.

Abutment	Offset	Approximate Bottom Elevation of Proposed Abutment (feet)	Approximate Top of Bedrock Elevation (feet)	Estimated Distance from Bottom of Abutment to Top of Rock (feet)
Abutment No. 1	LT	259	250.5	8.5
Abutment No. 1	RT	259	252.5	6.5
Abutment No. 2	LT	259	251.3	7.7
Abutment No. 2	RT	259	250.2	8.8

# 7.1.1 Axial Pile Resistance – Strength Limit State

The design of rock-socketed H-piles at the strength limit state shall consider;

- structural resistance of piles in axial compression,
- structural resistance of piles in combined axial loading and flexure, and
- compressive axial geotechnical resistance of piles.

The pile groups shall be designed to resist all lateral earth loads, vehicular loads, dead and live loads, and lateral forces transferred through the pile caps.

Structural Resistance. Per LRFD Article 6.5.4.2, at the strength limit state, the axial resistance factor  $\phi_c = 0.60$  shall be applied to the structural compressive resistance of the pile. Since the H-piles will be subjected to lateral loading, the piles shall also be checked for combined axial compression and flexure as prescribed in LRFD Articles 6.9.2.2 and 6.15.2. This design axial load may govern the design. Per LRFD Article 6.5.4.2, at the strength limit state, the axial resistance factor  $\phi_c = 0.70$  and the flexural resistance factor  $\phi_f = 1.0$  shall be applied to the combined axial and flexural resistance of the pile in the interaction equation (LRFD Eq. 6.9.2.2-1 or -2). H-piles shall also be analyzed for fixity using LPile® v2016 (LPile) software, or similar. It is the responsibility of the structural engineer to calculate the factored axial structural compressive resistances based on the lengths of the upper and lower unbraced pile segments, as determined from LPile, using a resistance factor of  $\phi_c = 0.70$  for combined axial and bending and appropriate effective length factors (K). These resistances may be the controlling values.

Geotechnical Resistance. The axial geotechnical resistance of rock-socketed H-piles at the strength limit state shall be calculated using the methodology for drilled shafts end bearing in bedrock by computing a drilled shaft tip resistance in rock according to LRFD Article 10.8.3.5.4c. Bedrock below the base of the pile bearing elevation is to be assumed to be jointed, therefore LRFD Eq. 10.8.3.5.4c-2 shall be used. The uniaxial compressive strength assumed in the design shall be no greater than the average of the UCS tests provided in this report. A Licensed Geologist with experience in geotechnical engineering applications shall determine the Hoek-Brown strength parameters and Geological Strength Index (GSI) of the bedrock at the abutment locations. Per LRFD Table 10.5.5.2.4-1, at the strength limit state, a resistance factor of  $\phi_{\text{stat}} = 0.50$  shall be applied to the compressive axial geotechnical resistance of the pile.

The governing axial pile resistance will be the lesser of the factored structural resistance and factored geotechnical resistance. The maximum applied factored axial pile load shall not exceed the governing factored axial pile resistance.

#### 7.1.2 Axial Pile Resistance – Service and Extreme Limit State

The design of H-piles at the service limit state shall consider tolerable transverse and longitudinal movement of the piles and pile group movements/stability. For the service limit state, resistance factors of  $\phi = 1.0$  shall be used in accordance with LRFD Article 10.5.5.1. The exception is the overall global stability of the foundation which shall be investigated at the Service I load combination and a resistance factor,  $\phi$ , of 0.65.

Extreme limit state design checks for the rock-socketed H-piles shall include pile axial compressive resistance, overall global stability of the pile group, pile failure by uplift in tension, and structural failure. The extreme event load combinations are those related to extreme hydraulic and scour events. Resistance factors for extreme limit states, per LRFD Article 10.5.5.3, shall be taken as  $\phi = 1.0$  with the exception of uplift of piles, for which the resistance factor,  $\phi_{up}$ , shall be 0.80 or less per LRFD Article 10.5.5.3.2.

The maximum applied factored axial pile load for the service and extreme limit states shall not exceed the factored axial pile resistance.

#### 7.1.3 Lateral Pile Resistance/Behavior

In accordance with LRFD Article 6.15.1 and LRFD Article 10.8.3.8, the structural analysis of pile groups subjected to lateral loads shall include explicit consideration of soil-structure interaction effects as specified in LRFD Article 10.7.3.12. A fixed condition at the pile tip shall also be confirmed with soil-structure interaction analyses. For shafts socketed into rock, the input properties used to determine the response of the rock to lateral loading shall assume the rock mass is fractured such that its intact shear strength is compromised following the guidance of LRFD Articles 10.4.6.4 and 10.8.2.3.

A series of lateral pile resistance analyses shall be performed to evaluate pile behavior at the abutments using LPile, or similar, software. The designer shall utilize the lateral pile analyses to evaluate the associated pile stresses, bending moments, and fixity due to factored pile head loads and displacements.

Geotechnical parameters for generation of soil-resistance (p-y) curves in lateral pile analyses shall be developed and provided with the rock-socketed Hpile design. The models developed shall emulate appropriate structural parameters and pile-head boundary conditions for the pile section(s) being analyzed.

# 7.1.1 Rock-Socketed Pile Quality Control

Rock-socketed piles shall be constructed in accordance with Special Provision 501 (Rock-Socketed H-Pile Foundations).

The rock socket shall be detailed such that grout can be reliably placed below and around the pile tip and promote, full, uniform load transfer to end bearing in bedrock. The detail shall include provisions to achieve the required grout base thickness beneath the bearing plate.

To prevent caving of existing soil deposits, the holes for rock-socketed pile shall be drilled through the overburden by advancing temporary casing with an inner diameter that is, at a minimum, the design diameter of the bedrock socket. The temporary casing shall be equipped with a cutting shoe capable of establishing a positive seal in bedrock to prevent soil and groundwater infiltration into the bedrock socket.

Rock sockets shall be cleaned of all loose material using an airlift or vacuum truck. The socket shall be inspected for cleanliness immediately prior to grout placement.

Tremie grout tubes detailed to remain permanently as part of the rock socket shall be filled with a non-shrink grout listed on the MaineDOT QPL.

The portion of the rock socket above the grout column shall be backfilled with aggregate meeting for the requirements of Subsection 703.22, Underdrain Backfill Material, Type C.

The rock sockets shall be constructed such that the piles meet the required positioning tolerances when centered in the drilled hole.

# 7.1.1 Corrosion Mitigation

Per LRFD Article 10.7.5, soils with a pH less than 5.5 and electrical resistivity less than 2,000 ohm-cm should be considered as indicative of a potential corrosion situation. A pH test conducted on a representative sample of the marsh deposit measured a pH of 5.27. A soil electrical resistivity test on the same sample measured 1,864 ohm-cm. The borings conducted at both Abutment No. 1 and Abutment No. 2 indicate the piles will be installed in the corrosive deposit. Therefore, corrosion mitigation countermeasures for piles installed at both abutments is required. The bridge design shall incorporate one of the following corrosion countermeasures at each rock-socketed H-pile:

- 1) Install a jointless HDPE isolation casing in accordance with Special Provision 501 (Pile Casings) from the bottom of the concrete pile jacket to the top of bedrock. The casing shall have a minimum inside diameter of 30 inches. The isolation casing may be extended to the bottom of the abutment stem and be used as the formwork for the concrete jacket.
- 2) Design the rock-socketed H-pile for an assumed section loss resulting from a corrosion rate of 0.0014 in/yr per side of steel, for the specified design life of the structure.

#### 7.2 Integral Abutment and Wingwall Design

Integral abutment sections shall be designed for all relevant strength, service, and extreme limit states and load combinations specified in LRFD Articles 3.4.1 and 11.5.5. A resistance factor ( $\phi$ ) of 1.0 shall be used to assess abutment design at the service limit state, including: settlement and excessive horizontal movement. The overall stability of the foundation shall be investigated at the Service I Load Combination and a resistance factor,  $\phi$ , of 0.65. Resistance factors for extreme limit state shall be taken as 1.0.

The designer shall assume Soil Type 4 (MaineDOT Bridge Design Guide (BDG) Section 3.6.1) for abutment backfill material soil properties. The backfill properties are as follows:

- Internal Friction Angle ( $\phi$ ) = 32°
- Total Unit Weight  $(\gamma) = 125 \text{ pcf}$
- Soil-Concrete Interface Friction Angle ( $\delta$ ) = 17° (ref: LRFD Table 3.11.5.3-1)

Integral abutments and in-line wingwalls shall be designed to withstand a lateral earth load equal to the passive pressure state. Estimation of passive earth pressure shall consider LRFD C3.11.5.4, which states that the relative wall movement to induce full passive pressure is approximately 0.05 for dense backfill, and FHWA NHI-06-089 Figure 10-4 which supports a  $K_p$  of 6.0 and greater for dense backfills and wall rotations equal to or greater than 0.02. This figure is reproduced in Appendix E-References.

The backfill slope at both abutments is negligible and may be assumed to be level. Using Rankine Theory, a lateral earth pressure coefficient of 3.3 shall be assumed, except when the ratio of lateral movement to wall height exceeds 0.004, in which case the passive earth pressure coefficient shall be determined from MassDOT LRFD Bridge Design Manual Figure 3.10.8-1. This figure is reproduced in Appendix E – References. A load factor for passive earth pressure is not specified in LRFD. For purposes of the integral abutment backwall reinforcing steel design, use a maximum load factor ( $\gamma_{EH}$ ) of 1.50 to calculate factored passive earth pressures.

Additional lateral earth pressure due to live load surcharge is required per Section 3.6.8 of the MaineDOT BDG for abutments if an approach slab is not specified. When a structural approach slab is specified, reduction, not elimination of the surcharge load, is permitted per LRFD Article 3.11.6.5. The live load surcharge shall be estimated as a uniform horizontal earth pressure due to an equivalent height of soil (heq) taken from the table, below:

Abutment Height	h <sub>eq</sub>
(feet)	(feet)
5	4.0
10	3.0
≥20	2.0

In-line wingwalls shall be designed considering a live load surcharge equal to a uniform horizontal earth pressure due to an equivalent height of soil of 2.0 feet. An at-rest earth pressure coefficient, K<sub>o</sub>, of 0.47 shall be used for live load surcharge loads placed upon wingwalls cantilevered off of abutments with the top of the wall restrained from movement.

#### 7.3 Abutment Sections

The abutment design shall include a drainage system behind the abutment to intercept any groundwater. Drainage behind the structure shall be in accordance with MaineDOT BDG Section 5.4.2.13.

Backfill within 10 feet of the abutments and side slope fill shall conform to MaineDOT Specification 703.19 – Granular Borrow for Underwater Backfill. The gradation of this material specifies 7 percent or less of the material passing the No. 200 sieve. Limiting the amount of fines is intended to minimize frost action and eliminate the need to design for hydrostatic forces by promoting drainage behind the structure.

Slopes in front of the pile-supported integral abutments shall be constructed with riprap and erosion control geotextile. The slopes shall not exceed 1.75H:1V in accordance with MaineDOT Standard Detail 610(03).

# 7.4 Settlement and Embankment Stability

The vertical alignment of the new Little Tomah Bridge will closely match the existing. The bridge approach embankments will be constructed using granular borrow placed over medium dense to very dense granular fill overlying primarily dense coarse-grained and hard fine-grained native soil deposits and bedrock. Any loose soils encountered at the subgrade elevation shall be thoroughly compacted prior to backfill operations. With these provisions, any settlement at the proposed bridge approaches is anticipated to be small and immediate.

Conventional earth fill embankments constructed over the existing soils using MaineDOT Standard Specifications, with side slopes of 2H:1V or flatter, are anticipated to satisfy stability requirements. Slopes steeper than 2H:1V shall be treated with riprap using MaineDOT standard details. Slopes shall be no steeper than 1.75H:1V.

Settlement of the steel H-piles bearing in bedrock will be limited to elastic compression of the piles and is anticipated to be minimal.

#### 7.5 Frost Protection

Foundations placed on soil shall be designed with an appropriate embedment for frost protection. According to MaineDOT BDG Figure 5-1, Maine Design Freezing Index Map, Codyville has a design freezing index (DFI) of approximately 1850 F-degree days. The anticipated coarse-grained fill soil was assigned a water content of 10%. These components correlate to a frost depth of 7.6 feet. Any foundation bearing on soils shall be embedded 7.6 feet for frost protection.

Pile-supported integral abutments shall be embedded a minimum of 4.0 feet for frost protection per MaineDOT BDG Section 5.2.1.

Riprap is not to be considered as contributing to the overall thickness of soils required for frost protection.

# 7.6 Seismic Design Considerations

In conformance with LRFD Table 4.7.4.3-1 seismic analysis is not required for single-span bridges regardless of seismic zone.

# 8.0 CONSTRUCTION RECOMMENDATIONS AND CONSIDERATIONS

Any peat, organics, soft or loose soils encountered at the subgrade elevation at either abutment shall be excavated in its entirety and replaced with Granular Borrow – Material for Underwater Backfill and the exposed subgrade then thoroughly compacted.

Excavation for the abutments is anticipated to be accomplished using sloped open cut methods in accordance with MaineDOT and OSHA requirements. Excavations will expose soils that may become saturated and water seepage may occur during construction. There may be localized sloughing and instability in some excavations and cut slopes. The contractor should control groundwater, surface water infiltration, and soil erosion. Water should be controlled by pumping from sumps.

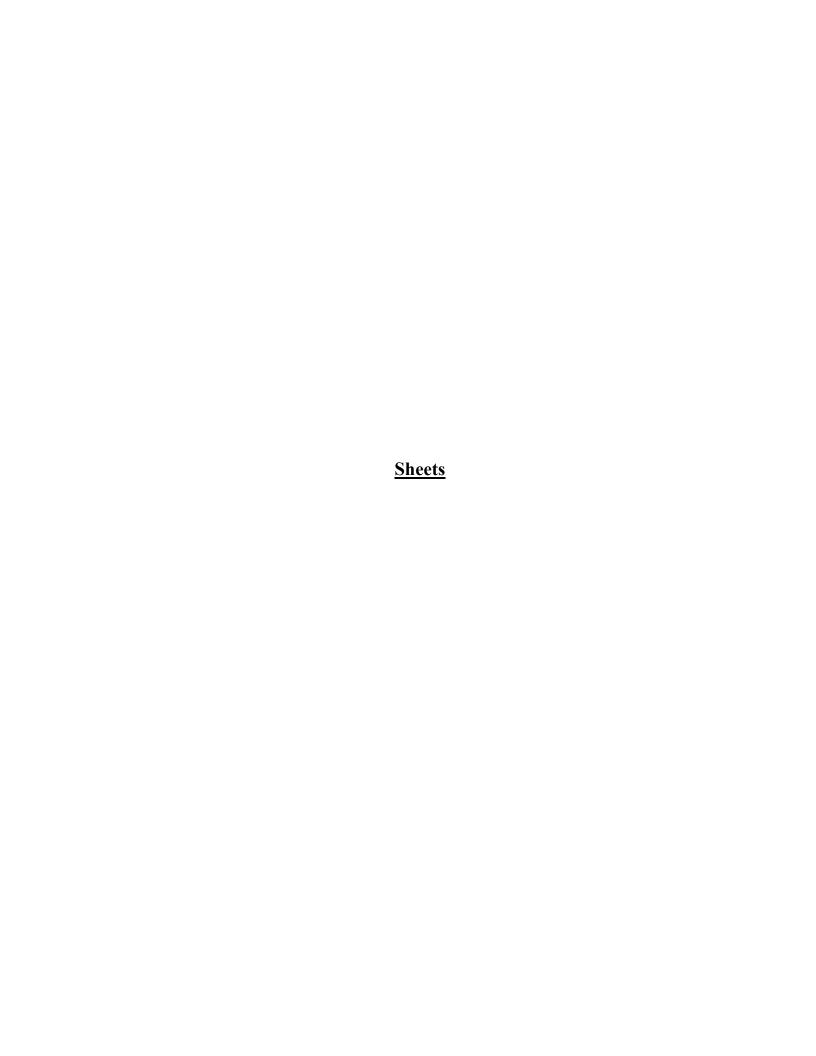
Previous structures at the bridge were founded on concrete abutments and log crib abutments partly filled with stone. Wood, concrete or stone may create obstructions for construction activities and will need to be removed by conventional excavation methods.

## 9.0 CLOSURE

This report has been prepared for the use of the MaineDOT Bridge Program for specific application to the proposed replacement of Little Tomah Bridge in Codyville Township, Maine in accordance with generally accepted geotechnical and foundation engineering practices. No other intended use or warranty is expressed or implied.

In the event that any changes in the nature, design, or location of the proposed project are planned, this report should be reviewed by a geotechnical engineer to assess the appropriateness of the conclusions and recommendations and to modify the recommendations as appropriate to reflect the changes in design. These analyses and recommendations are based in part upon limited subsurface investigations at discrete exploratory locations completed at the site. If variations from the conditions encountered during the investigation appear evident during construction, it may also become necessary to re-evaluate the recommendations made in this report.

It is recommended that a geotechnical engineer be provided the opportunity for a review of the final design and specifications in order that the earthwork and foundation recommendations and construction considerations presented in this report are properly interpreted and implemented in the design and specifications.



# **CODYVILLE, MAINE**



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1.5 Miles
1 inch = 1.61 miles

Date: 12/12/2024 Time: 10:29:39 AM

SHEET NUMBER

1

OF 5

LITTLE TOMAH BRIDGE
LITTLE TOMAH STREAM
CODYVILLE WASHINGTON CTY.

LOCATION MAP

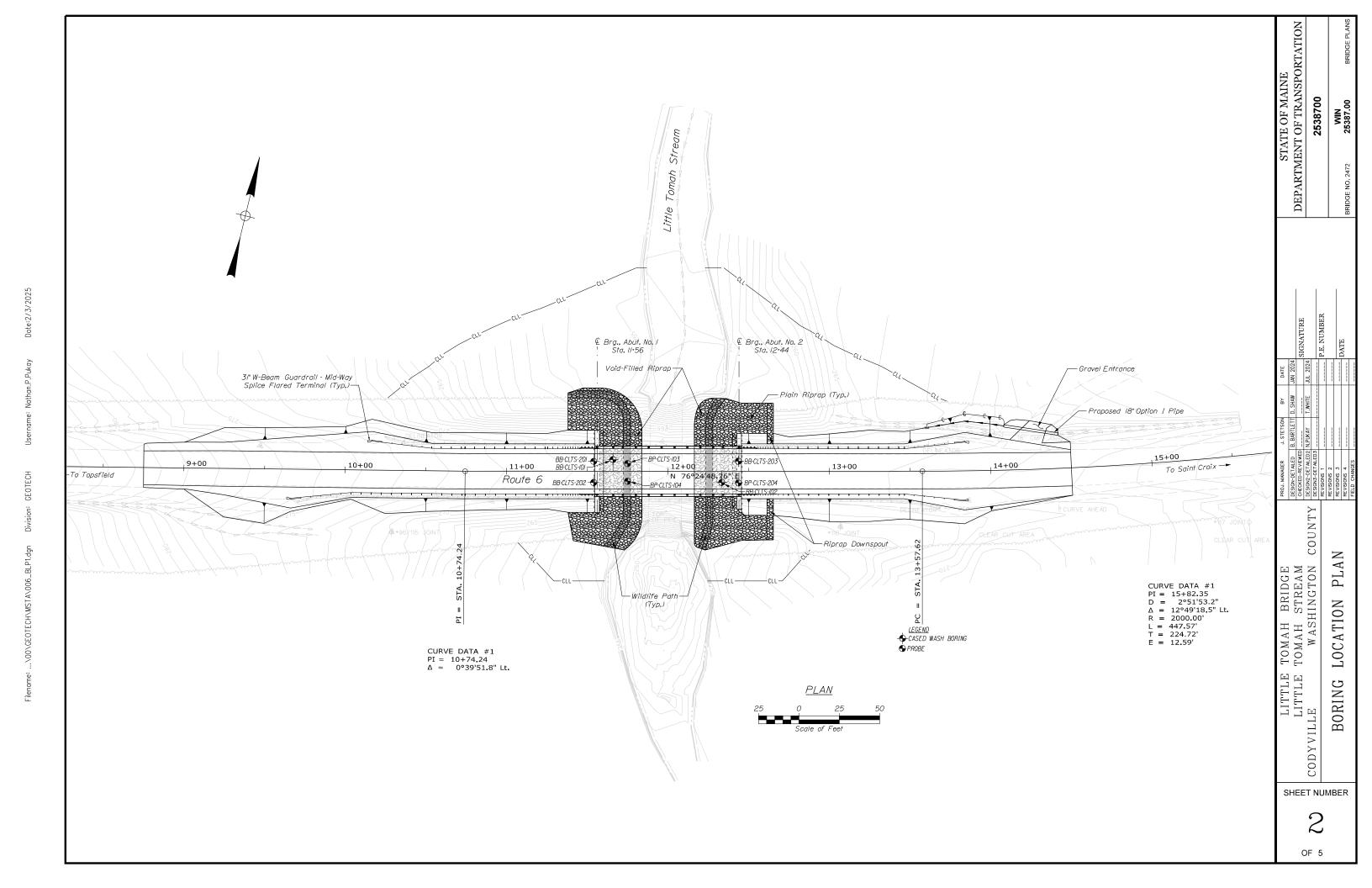
STATE OF MAINE DEPARTMENT OF TRANSPORTATION

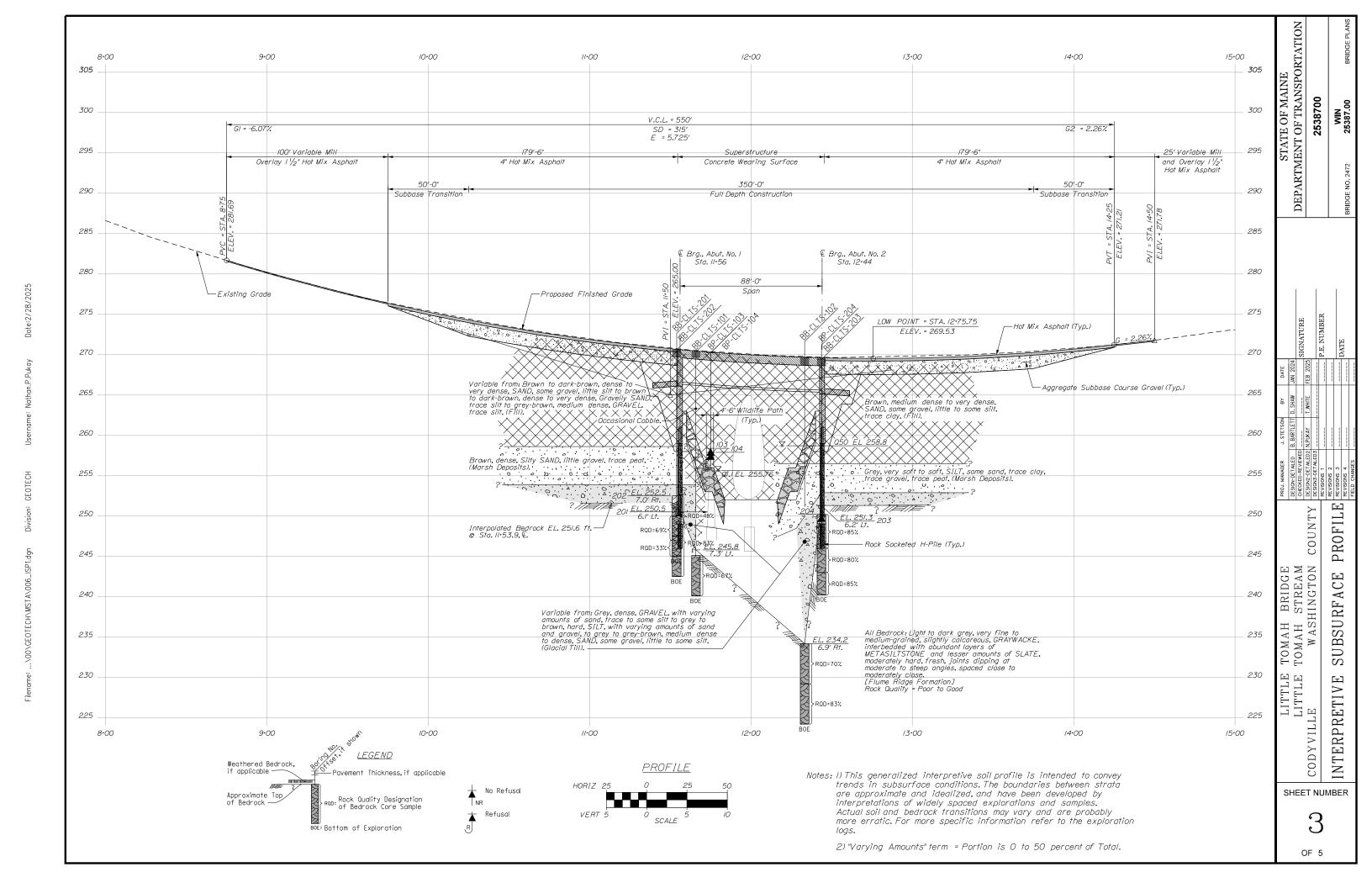
2538700

WIN

BRIDGE NO. 2472 **25387.00** 

BRIDGE PLANS





Sept	riller			Matne00T			evat f <b>o</b> n	(ft.)			Auger 1D/0D: 5" Solitd Stem
State   Control   Contro	ogged i				gett .						Sampler: Standard Split Speed Hammer Wt./Fall: 140w/30"
Appendix	at <b>o</b> St	art/F				Dri	lling	Mathed			h Bering Core Barrel: NG-2"
1.											
Common   C	ommer of finite fo	ne:	rency Fo	seter: 0.974	R - Rock			pe.	34	- Peck/F	efolded Ffeld Yone Undrafned Sheer Strength (pef)Ty-Pecket Torvane Sheor Strength
10   24/13   5.00   16/14/15/15   27   44   69   75   75   75   75   75   75   75   7				paen Sample A	rtempt HSA = Hol RC = Reil	low Ster ler Cene	n Auger		95 H-U	= Uncert	between controllings control strength (par) at a source current, percent fined Compressive Strength (ker) LL = Liquid Lithir ad = Rev Field SPT N-value PL = Plastic Literit
10   24/13   5.00   16/14/15/15   27   44   69   75   75   75   75   75   75   75   7	= Uneu	Vens	ul Thin No Shear Test	PP = Peo	s Attempt 101 - 101 ket Penstremeter 107/C	ight of 1 = Waltght	of Rade	er Cost	mg Mac	= SPT +	plency Footer - Riig Specific Annual Califoration Value PI - Placeticity Index -uncorrected Corrected for Namer Efficiency 6 = Graft Stat Analysis - Editablesy Earlier (2018) uncorrected 6 - Committee from Tools
### 1	-		^		Sample Information		J			1	1
### ### ##############################	- 1	•		•		oprrested		2.6	\$ t	1 -	Visual Description and Remarks AASHII
10   36/13   5:00   15/16/17/41   33   34   10   10   10   10   10   10   10   1	ge e	Š	ě	<b>5</b> ±	5 4 4 5 P	ž	N60		94	P. P.	
20   24/22   10.00 -   16/14/13/15   22   44   64   65   65   10.00 -   16/14/13/15   22   44   64   65   65   65   65   65   65	Ĺ							SSA	269.	7 ×××	7 MMA. 0.6-
20   24/22   10.00 -   16/14/13/15   22   44   64   65   65   10.00 -   16/14/13/15   22   44   64   65   65   65   65   65   65	L								1	₩	
20   24/22   10.00 -   16/14/13/15   22   44   64   65   65   10.00 -   16/14/13/15   22   44   64   65   65   65   65   65   65	L								1	₩	
20   24/22   10.00 -   16/14/13/15   22   44   64   65   65   10.00 -   16/14/13/15   22   44   64   65   65   65   65   65   65									1	₩	
20   24/22   10.00 -   16/14/13/15   22   44   64   65   65   10.00 -   16/14/13/15   22   44   64   65   65   65   65   65   65	, L									₩	
20   24/22   10.00 -   16/14/15/15   27   44   69   19   19   19   19   19   19   19		1D	24/19	5.00 - 7.00	15/16/17/41	33	54			₩	
22   23   24   25   25   25   25   25   25   25	Г							П	1	₩	Occastenci cebbie.
22   23   24   25   25   25   25   25   25   25	Г							П	1	₩	
22   23   24   25   25   25   25   25   25   25									1	₩	
22   23   24   25   25   25   25   25   25   25								W	1	₩	
22   23   24   25   25   25   25   25   25   25	٠ 🕇	2D	24/22	10.00 -	16/14/13/15	27	44	69	1	₩	Dark brown, dry, dense, Gravelly SAND, IT+tle stit, trace argantes, (Ffil).
15.00	$\vdash$			12.00				59	1	₩	
15.00	$\vdash$							27	1	₩	
15   15   100   17   17   18   13   11   17   17   17   18   17   17   18   18	$\vdash$	$\dashv$							1		
30   24/5   15:00	$\vdash$	$\dashv$						_	1	₩	
### A This year of 17.0 ft bigs.  ### AT This year of 17.0 ft bigs.  #### AT This year of 17.0 ft bigs.  ### AT This year of 17.0 ft bigs.  ### AT This year	5	-	04.5	15.00 -	10541	-		_	1	₩	Grey-brown, wet, medium dense, GRAVEL, troce stit.
### A The sound of 17.0 of togs.    ### 17.2  ### 20.00 - 14/15/15/23 30 49 43    ### 20.00 - 22/14 20.00 - 14/15/15/23 30 49 43    ### 20.00 - 22/14 20.00 - 14/15/15/23 30 49 43    ### 20.00 - 22/15 22/1	H	30	24/5	17.00	4/3/9/11		13	-	1	₩	terii).
### ### ### ### ### ### ### ### ### ##	$\vdash$	-						-	253.	, 🞇	PEAT for wash at 17.0 ft bas.
40   24/14   20.00	$\vdash$	_							-	HIN	17.2-
### ### ### ### ### ### ### ### ### ##	L							_	4	Hi	
### 14/15/15/23   30   49   43   43   43   43   43   43   43	۰,							76	1	Ш	Grey, wat, dense, GRAVEL, some sond, trops stit. GR3375
### 60/60   25-20 -   R00 = 67%   N00 <sup>2</sup>    ### 60/60   25-20 -   R00 = 67%   N00 <sup>2</sup>    ### 60/60   25-20 -   R00 = 67%   N00 <sup>2</sup>    ### 60/60   25-20 -   R00 = 67%   N00 <sup>2</sup>    ### 60/60   25-20 -   R00 = 67%   N00 <sup>2</sup>    ### 60/60   25-20 -   R00 = 67%   N00 <sup>2</sup>    ### 60/60   25-20 -   R00 = 67%   N00 <sup>2</sup>    ### 60/60   25-20 -   R00 = 67%   N00 <sup>2</sup>    ### 60/60   25-20 -   R00   67%   R00   67%   R00   R00    ### 60/60   R00   R00   R00   R00   R00   R00   R00    ### 60/60   R00   R00   R00   R00   R00   R00   R00    ### 60/60   R00   R00   R00   R00   R00   R00   R00    ### 60/60   R00   R00   R00   R00   R00   R00   R00    ### 60/60   R00   R00   R00   R00   R00   R00   R00    ### 60/60   R00   R00   R00   R00   R00   R00   R00    ### 60/60   R00   R00   R00   R00   R00   R00   R00    ### 60/60   R00   R00   R00   R00   R00   R00   R00    ### 60/60   R00   R00   R00   R00   R00   R00   R00    ### 60/60   R00   R00   R00   R00   R00   R00   R00    ### 60/60   R00   R00   R00   R00   R00   R00   R00   R00    ### 60/60   R00   R00   R00   R00   R00   R00   R00   R00   R00    ### 60/60   R00    ### 60/60   R00    ### 60/60   R00   R	Ŀ	4D	24/14	20.00 -	14/15/15/23	30	49	43		Ш	(Glasfal TTII). A-1-a- ( WC=8.
### 60760 25-20 - R00 = 67% N002  ### 60760 25-20 - R002	L							69	1	III.	
0175   25.18	L							201	1	Ш	
### 60/60   25:30 -								224		Ш	
R1 60/60 30.20 R0 = 675 N02  R0 = 675 N02  R1 is decreased (Fight to early grey, very fifth a medium- gradual, at light to correct and substitution of the correction of the c	5 L							<b>©</b> 175	245.	, 11111	24.5
Morat Core benefit bridge during (1). 247.10 in The left 23.2-30.2 ft bgs (E1, 247.1 - E1, 240.1)  EXEMAL  Formal bridge during (1). Quiter steel shell of core bornel left in hole of 23.2-30.2 ft bgs (E1, 247.1 - E1, 240.1)  Fiftherte These represent core-before sequence of 1, pages promitting as greater.  Pogs 1 of 1		R1	60/60	25.20 - 30.20	ROD = 67%			NO-2			R1: Bedrock: Light to dark grey, very fine to medium-
Morat Core benefit bridge during (1). 247.10 in The left 23.2-30.2 ft bgs (E1, 247.1 - E1, 240.1)  EXEMAL  Formal bridge during (1). Quiter steel shell of core bornel left in hole of 23.2-30.2 ft bgs (E1, 247.1 - E1, 240.1)  Fiftherte These represent core-before sequence of 1, pages promitting as greater.  Pogs 1 of 1											grafned, elightly cologreous, GRAYNACKE, Interbedded with abundant layers of METASILISTONE and lesser
Morat Core benefit bridge during (1). 247.10 in The left 23.2-30.2 ft bgs (E1, 247.1 - E1, 240.1)  EXEMAL  Formal bridge during (1). Quiter steel shell of core bornel left in hole of 23.2-30.2 ft bgs (E1, 247.1 - E1, 240.1)  Fiftherte These represent core-before sequence of 1, pages promitting as greater.  Pogs 1 of 1											dipping joints, closely spood.
Morat Core benefit bridge during (1). 247.10 in The left 23.2-30.2 ft bgs (E1, 247.1 - E1, 240.1)  EXEMAL  Formal bridge during (1). Quiter steel shell of core bornel left in hole of 23.2-30.2 ft bgs (E1, 247.1 - E1, 240.1)  Fiftherte These represent core-before sequence of 1, pages promitting as greater.  Pogs 1 of 1									1		Reck Qualify = Fair Ri: Core Times (minises)
Morat Core benefit bridge during (1). 247.10 in The left 23.2-30.2 ft bgs (E1, 247.1 - E1, 240.1)  EXEMAL  Formal bridge during (1). Quiter steel shell of core bornel left in hole of 23.2-30.2 ft bgs (E1, 247.1 - E1, 240.1)  Fiftherte These represent core-before sequence of 1, pages promitting as greater.  Pogs 1 of 1	٦.							1/	1		25.2-26.2 ft (1:50) 26.2-27.2 ft (1:40)
Morat Core benefit bridge during (1). 247.10 in The left 23.2-30.2 ft bgs (E1, 247.1 - E1, 240.1)  EXEMAL  Formal bridge during (1). Quiter steel shell of core bornel left in hole of 23.2-30.2 ft bgs (E1, 247.1 - E1, 240.1)  Fiftherte These represent core-before sequence of 1, pages promitting as greater.  Pogs 1 of 1	ľТ							*	240.	1	28.2-29.2 ft (2:09) 29.2-30.2 ft (2:59)
Reference of Explanation at 30.2 feet below ground surficies.  Reference of Explanation at 30									1		100% Receivery Note: Core barnel broke during R1. R1 core was
Reference of Explanation at 30.2 feet below ground surficies.  Reference of Explanation at 30									1		obtoined. Outer shell of core bornel left in hole of 23.2-30.2 BGS (El. 247.1 to El. 240.1).
re Borrel broke during Rt. Outer steel shall of core borrel left in hole of 23.2-30.2 ft bge (El. 247.1 - El. 240.1)  Intification times represent appropriate basecrate services each space from those appropriate parameters approp	Т								1		Bottom of Exploration at 30.2 feet below ground surface.
re Borrel broke during Rt. Outer steel shall of core borrel left in hole of 23.2-30.2 ft bge (El. 247.1 - El. 240.1)  Intification times represent appropriate basecrate services each space from those appropriate parameters approp	F								1		
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intification these represent appropriates bounder to between each space impositions any to groups.  Page 1 of 1											
the load control has been set at 15m and one contition stated. On partie (limited and on any time state	ore B	arrel	broke o	our Ing R1.	uuter steel shell e	of core	barre	ı left	In ho	ie at	(5.2-30.2 +† bgs (El. 247.1 - El. 240.1)
the load control has been set at 15m and one contition stated. On partie (limited and on any time state											
ter lead reachings have been made at these and under conditions stated. Craudiciter fluiduations may seau, due to conditions other actions of the BB-CLTS-101 on those present at the time maturements eare made.											
1 2 3 4 4 4 4 4 4	licter i	ovel r	eodings ha	we been mode - ne time messur	ot tilmes and under eand! ements were mode.	tions st	reted. C	reunded	er flue	ruat Tens	may secur due to conditions other   Boring No.: BB-CLTS-101
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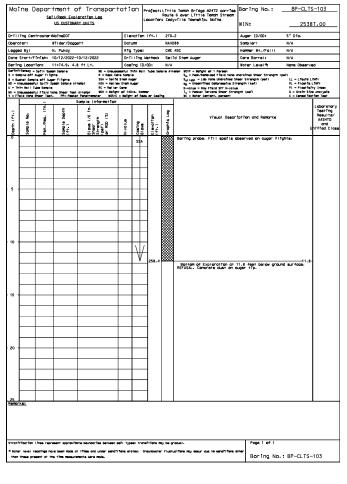
Maine Department of Transportation | regentlithe teams Bridge #2472 corries | Boring No.: | Satisface Experiention Lea | Leading Transportation | Satisface | Sati

Soft/Rock Exploration Log US CUSTOWARY UNITS

BB-CLTS-101

25387.00

				WRY UNITS.								387.00
Orti Oper	ter:		MatneDDT Wilder/Dags	jett		vat f <b>o</b> n	(ft.		269. NAVD	68		Spift Spoon
	od By:		N. Pukay	10:45-14:00		Type:	dathe		CME			
Bor N	ng Loca	rt fen:	12+33.2. 6.	.9 ft Rt.	Cas	otng ID	/00:		HV(4	.0"/4	5") Water Level*: 16.0 ft b	gs
effm	rtens:		oter: 0.974	R - Rook	Cere Sa	mer Ty	e:		ş	tte E	solded Ffeld Vene Undrefned Sheer Strength (pef) L. Peeket Tervene St	eor Strength (pa
			peen Somple Ar III Tube Somple . PP = Peed one Sheer Tea	trempt HSA = He RC = Rel s Attempt WOH = Wol set Pemetremeter WOR/C t Attempt WOTP = Wo Somple Information	In Stee	- Lunar	er co	eīng	Neo **	unconf errecht r Efft SPT N	is from Unforthed Sheer Firengin (per) IR = Notes Contents and Cooperative Strength (note) II = Littual following and English Strength (note) II = Littual following Force = Rig Specific Annual Collonof ten Yous II = Pleas Tell Littual English Contents (note = Note Strength of English S	
Depth (ft.)	on eldes	Pen./Rec. (In.)	Sample Depth (ft.)	Blows (76 fn. Sheor Strength (psf)	N-uncorrected	Neo	Coatng		(ft.)	Graphta Leg	Viewal Description and Remarks	Laborator Testing Results AASHTO and Unified Cle
0							SSA	26	8.7		11 ° 1844.	.9-
5 -	1D	24/20	5.00 -	12/17/20/17	37	60					Brown, dry, very dense, SAND, some gravel, little at	+. G#337519
		-	7.00		-							A-1-b- S WC=5.0%
10 -	20	24/18	10.00 -	4/4/5/5	9	15	16	-			Brown, moist, medium dense, SAND, some stit, some gravel, trace clay. (Ffil).	G#337521 A-2-4, SC WC=13.9
							16	+	56.6			.0-
15 -	3D	24/15	15.00 - 17.00	2/WOR/WOR/WOR			9				Grey, wet, very soft, SILT, some sond, trace clay, trace gravel, (Morsh Deposits).  Dark brown PEAT observed in wash at 17.0 ft bgs.	G#33752* A=4. CL WC=33.9* Non-Pigst
20 -							14					
	4D	24/14	20.00 -	3/4/13/16	17	28	40 61 75		18.3		4D: Orey, wat, medium dense, SNNO, same gravel, little stit, trade pact, (Glocial Till).	-3- G#33752; G A-1-B- SW WC=14-1;
25 -	5D	24/14	25.00 - 27.00	11/23/33/37	56	91	74 70 62				Grey, wet, very dense, Sandy GRAVEL, some efit, (Glocial Tfil).	
							69 86 96	-		7.1		
30 -	6D	24/18	30.00 - 32.00	40/59/47/48	106	172	121 47 48	-			Grey, wet very dense, GRAVEL, some afit, some sond, (Glocial Tfil).	
							110	-				
35 -	70 R1	5/1 60/60	35.40 - 35.42 35.40 - 40.40	RQD = 70%			495 NO-3	-	14.2		O55 blows for 5".  [Orey, wet, very dense, GRAYEL (Bedrook), troce stit.  Top of Bedrook at Elev. 234.2 ft.  RI: Bedrook: Light to dork grey, very fine to medium- grained, slightly color-cous, RRAYBACK. Interbedded with obundent loyers of METASLISTONG onl leaser	.4-
40 -	R2	60/60	40.40 -	RQD = 83%							(very en very comes univers teleconomic troop and (very comes to the very state). The of Finderson of Eleva 254-25. The of Finderson of the very first to end the very state of the condent of the very state of the condent of the con	
	né	00/60	45.40	NW # 83%							39.4-404 ft (3:10)	z
45 -							V	/	24.2		22 Secrees: Striller to PL except with several quere colorts encolorts encolored frontenes. [Flums Ridge Fermation] 60.4-61.4 ff (1123) 60.4-61.4 ff (1123) 42.4-63.4 ff (1120) 42.4-63.4 ff (1120) 63.4-63.5 ff (1020)	
											44.4-45.4 ft (1122)  100X Recovery 45 	4- 6.
50 emo	rke:		<u> </u>		_	_				_		



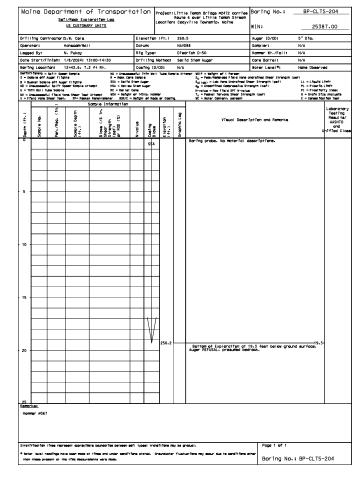
		Set	J/R <b>oc</b> k Exd US CUSTOMA	eration Log RY UNITS			Leca	t ion:	Cod	o 6 over Littis Tamah Stream yville Tawnship, Maine	WIN:	2538	7.00
Detii	Ing Cor	trooter#	laTneDOT		Ele	wat To	n (ft	.)	270	.2	Auger 1D/0D:	5" Drg.	
Opero	_		Tider/Dogg	ett	_	um:			NAVI		Samplers	N/A	
Logge	ed By:		. Pukay		Rfq	Турв			CVE	45C	Hommer Wt./Foll:	N/A	
				10/12/2022		Hing				Td Stem Auger	Core Barrel:	N/A	
	ng Local		1+74.9. 6.			ing I			N/A		Water Level*:	None Observ	ed .
8 - 84 40 - 4 U - TR	icket Serç Insuccessi I'm Vgi i 1	ube Somple ul Freid Ve Shear Test	r Fitghts sen Sample At ne Shear Test PP= Paske	SSA = S	icite Stem A loi low Stem oller Cone loight of 14 R/C = Natght	Auger Auger				compt VDIP = Watght of I Parson Sui = Peat-Memoided Flate Vone i Sui (ap) = Lob Vone Watenshed Si ep = Uncertified Comptoned Si ep = Uncertified Comptoned Si H-value = Res Field ST H-value T <sub>V</sub> = Peatest Tervone Shear Since WC = Water Contant, persons	ear Strength (pef)	(pef) LL = Lfqufd i PL = Plastfa PI = Plastfa PI = Plastfa G = Grafn Sfi C = Careal fide	Limit ty index a Analysis tion Test
Apth (ft.)	Sample No.	en./Rec. (In.	Sample Depth (+1.)	Bloss (/6 fn.) Shear Strangth (pef) or R00 (%)	-value	Costng	lavation	÷.	Prophic Log	Visual Descr	tptten and Remarks		Laborate Testing Results AASHTO and Intiffed CI
0						55/	_	8	×	Boring probe. Fill spoils o	beerved on ouger fl	īghts.	
					+	Ħ	1	8	₩				
	-				_	Н	-	8	₩				
						Н	4	8	₩	1			
					$\perp$	Ш	_	8	₩				
. 5 .	L_					Ш		8	₩				
						П		8	₩				
					$\top$	Ħ	1	8	₩				
					_	H	-	8	₩				
	-					Н	4	8	₩				
						Ш		8	₩				
- 10 -								8	₩				
. 10 .						IJ	,	8	₩				
						M		8	▓				
					+	₩	25	7. 9 B	<u></u>	Batter of Evaloration at	12 3 feat balow area	nd surface	
							1			Bettem of Exploretion of REFUSAL. Concrete dust on o	uger tip and bottom	filight.	
	-				_		-						
- 15 -					_	_	4						
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	$\vdash$				+	$\vdash$	+						
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25			-			1							
Remor	ka:					_				•			
Streti	on tool for	lines repre	eent apprexim	ote boundorfee betw	en eafl typ	ees tro	nef+fe	ne May	be q	roduci.	Page 1 of 1		
				t times and under a ments were mode.	endîtîens si	cted.	Graund	neter :	flust	uatifens may ecour due te cendififens c	Boring No		



OF 5

Effic fens: It Speen	înfah: Ton: Tency Fo	11+53.9. 6. octor: 1.066 poen Somple A	1:30-13:00 1 ft Lt.	Date	vetřen um: Type:			VD88		Auger 1D/0D:	5" Solld St	от	Drii	leri		S.W. Cole	ARY UNITS	EII	avat f <b>o</b> n	(ft.)	270.	6		N: ger 10/00:		tem
itart/F Least Least Effic Fens: It Span successfu	finfaths  Ton:  Tency Fo  Semple al Spift Si the Semple al Semple al Freid N	1/8/2024; 11+53.9, 6. sctor: 1.06	1 ft Lt.						ah D−50	Sampler:	Standard Sp		Open	otor: ed By:		Hanecom/Wa	п	Da	tum: g Type:	•	NAVD		Se	mpler:	Standard Sp 140#/30"	
Efficients th Speen successful successful successful successful successful successful successful	Semple Ji Spift Semple Ji Spift Semple Ji Thin No Jihan Testi Ji Freid W	paen Sample A			I I îng I		s: Co	sed 1	lash Bering	Core Barrel:	NO-2"		Date	Start/	Finish:	1/9/2024: 0	08:45-11:15	Dr	filfing k		Coso	d Wast	Bering Co	re Barrel:	NQ-2"	
ens: + Speen Lucosesti - Veril Ti Lucosesti d Veris : Lucosesti Lucosesti	Semple al Spift Sa be Semple al Thin No sheor Test al Freid V	peen Sample A			ing ID.				7/4.5")	Water Level*:	None Observ	ed				11+53.9. 7. Ictor: 1.066			ating 10/ mmer Typ					iter Level*: e & Catheod □	11.0 ft bgs	
veni Tu ucosseni d Vens 1 ucosseni g	be Somple il Thin No iheor Test il Freid V		R = Resk C SSA = Sei1	ere Som	Die .		Su Su	- Peo	Hydraulita   Avianted Field Vane Undrafted  Lob Vene Undrafted Shear Street  antitud Compressive Street (in	Rope & Catheod  Sheer Strength (pef) Ty- ngth (pef) VC	Pecket Tarvana Shao C = Bater Centent, p L = Lfqufd Lfmft	r Strength (pef) proent	Defin D = S	fttens: pitt Spec	n Sample	peen Somple A	R - Roos SSA - Si	Core So	Mp1s Auger		Su -	Pack/Res	Hydraul To  Rog melded Ffeld Vene Undreffned Shear to Yone Undreffned Shear Strength ( med Cempressive Strength (kef)	Strength (pef)Tu- Per	sket Tervone Shed Woter Centent, p Liquid Limit	or Stri
ģ	Ê					THE .		uncerr uncerr	enfined Compressive Strength (As socied = Row Field SPT N-velus Fffetency Footer = Rig Specific F N-uncernooted Corrected for Ho somer Effictency Footer/603348-s	rt) LL PL Annuel Celforation Velue	L = Liquid Limit L = Plastic Limit a: Pl = Plasticity l	ndex	U - 1	hfir Vall Unauccess	rful Spitt S Tube Semple rful Thin We	pean Somple A Il Tube Sampli	ttempt HSA = H RC = Re. e Attempt WSH = W ket Penetrometer WSR/C t Attempt WSTP = 1	ler Cene ler Cene	1401b. Hal	me-	N-una Home	erreste r Effic	med Celbressive Strength (ker) d d - Rev Fitald SPT N-value fandy Foster — Rig Speciffic Annu- uncernested Cernested for Homer r Efficiency Foster/60318N-uncer	LL = PL = I Celforerten Velue	Litourd Litera Pleasite Litera Pl = PleasiteTay	Index
		one Shear Tee	Attempt 101 - 102/c at Penstremater 102/c = Attempt 102/P - Met Sample Information	Belight ight of (	of Rade One Pers	er Cost	ring Kes	0 = SP 0 = (H	H-uncorrected Cerrected for Ho swer Effficiency Foster/60134H-u	mer Efficiency G Incorrected C	= Great Stas Analys = Cores I fdot for Tes	76	W -	Teld Vone Unauccess	Sheor Test Iful Fiteld V	ne Sheor Tear	ket Penetrometer WOR/O t Attempt WOIP = 1 Sample Informatio	= Nefgh leight ef	One Peras	er Costin	Neo -	(Home	uncerrected Cerrected for Homer r Effficiency Foster/60%14H-uncerr	Efficiency G = 0 exted C = 0	orafin Sfize Analys Censel fdatfen Tes	~
5		emple Depth	Howe (/6 fn. although pa+1	morrested		castng ilose	levation 5			secription and Remar		Loberatory Testing Results/ AASHTO and Unifited Class	igpth (ft.)	S S	L/Rec. (In.)	omple Dapth ft. I	ows (/6 fn.	ncorrected		catng	levation ft. i	aphta Leg	Vîsuel Descr	ption and Remarks	1	Lab Te Re A
	8	5,€	5 8 4 5 P	Ţ	N60	SSA	100	<u> </u>	5				0	Ş	*	8.5	28.83 P	Ĭ.	N <sub>6</sub> o		Шυ	9r	10° HMA.			1
																					269.8				0.8	
+							1																			
$\forall$							1						. 5	10	24/10	5.00 - 7.00	15/16/21/14	37	66				Brown, moîst, very dense sîit, (Fîii).	SAND, some grav	el. Ifttle	
$\exists$						П	1																			
						1/																				
						SPUN HW							- 10	20	24/9	10.00 -	16/11/10/7	21	37				Similar to 10, except de in tip of spoon.	nse. Materīai cha	nge observed	
																				\/	258.6		Material on ouger flight wet. Stity SAND, trace g	s from 12.0-15.0 rovel. (Marsh Dep	ft bgs: Brown osits).	:
													- 15	3D/A	24/12	15.00 - 17.00	8/9/9/11	18	32	,	254.6		3D (Top 3") Brown, wet, gravel, (Marsh Deposits)			,
$\dashv$						1	4							L.		17-00 -		-		27		H. I	3D/A (Bottom 9") Grey-br gravel, some afit, (Gio Brown, wet, Sandy SILT,	own. wet. dense. ctal Tfll). little gravel. ()	SAND, some Glactal Tfill)	
$\dashv$						+	+		1					4D R1	13-2/8	17.00 - 18.10 - 23.10	12/29/50(1.2*)) RQD = 48%		$\vdash$	39 035 NO-2	252.5		a 625 blows for 0.1 ft			1
$\dashv$						₩	4		1					H"	50/60	23.10	1140 - 40%	1	H	NO-2			Top of Bedrock at Elev. RI: Bedrock: Light gray grained: slightly calcor with obundant layers of amounts of SLATE, modera dipping joints, closely infilling. [Flume Ridge Formation] Beach Outling Beach	252.5 ft. to dark grey, fin	e to medium-	
R1	36/36	20.50 -	ROD = 69%			NO-2	250.	5	Top of Bedrock at El-	ev. 250.5 ft.	20.0	1	- 20					$\vdash$		+			with abundant layers of amounts of SLATE, modera	ETASILISTONE and tely hard, fresh	lesser steeply	21
									Ris Bedrecks Light g grained, alightly od with apundant lawers	rey to dork grey, f locreous, GRAYWACKE of METAS LITSTONE ~	fine to medium- interbedded and lesser				L			L					Inffiling. [Flume Ridge Formation]	.,	-Jioi re	21 20
$\Box$							1		amounts of SLATE, mo steeply dipping Join [Flums Rives Law-	derately hard, fresi ts, closely spaced.	sh. moderately to	1								$\Box$			Rock Quality = Poor R: Core Times (min:sec) 18.1-19.1 ft (4:18) 19.1-20.1 ft (3:37) 20.1-21.1 ft (3:35)			
R2	24/20	23.50 - 25.50	ROD = 33%			$\perp$	1		Top of Bedrock at El- Roller Comed obsed + Ril Bedrock Light by grained, alightly ou with abundant layers omaunts of SLATE, mo steeply dipping Join Flums Ridge Formati- Rock Quality = Fair Ril Core Times (min: 20.5-21.5 ft (3102) 21.5-22.5 ft (3132) 100X Recovery 100X Recovery	eec)				R2	60/60	23.10 - 28.10	RQD = 83%	1		$\perp$						
-						$\forall$	4		20.5-21.5 ft (3:02) 21.5-22.5 ft (3:15) 22.5-23.5 ft (3:28)				- 25					1		+			22.1-23.1 ft (6:02) 100% Recovery			
$\dashv$						Ť	245.							$\vdash$				+		+			R2: Bedrock: Similar to [Flume Ridge Formation] Rock Quality = Good R2: Core Times (min:sec)	R1. except more o	ompetent.	
$\dashv$							1		R2: Bedrock: Light g medium-grained, slig interbedded with abu lesser amounts of SL	ndant layers of MET. ATE: moderately har	ASILTSTONE and							+	Н	$\forall$						
$\dashv$							1		steeply dipping join [Fluma Ridge Formati Rock Quality = Poor R2: Core Times (min:	ts. closely spoced. on]								$\top$	$\Box$	¥	242.5		24.1-25.1 ft (4:03) 25.1-26.1 ft (3:05) 26.1-27.1 ft (2:54) 27.1-28.1 ft (3:10)			
									25.5-24.5 ft (3:26) 24.5-25.5 ft (3:38)	sec)			- 30												28.1	
				[			1		83% Recovery  Bottom of Exploration	at 25+5 feet below	ground aurfoca-		"						Ш				Bottom of Exploration at 2	s.1 feet below gr	round surface	
4							-							<u> </u>	-			1								
+							1											+	$\vdash$							
$\dashv$							1											+								
$\dashv$							1						- 35													
									1																	
1							1		1										$\Box$							
4							1		1									1	$\square$							
+							1		1				40	$\vdash$				1								
+							1		1									1								
+							1											1	Н							
J																										
I													45													
4							4							<u> </u>				1								
4							1							$\vdash$	-			1								
+							+								-			+	$\vdash$							
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												$\vdash$	So Remo	rke:			I .					ш				_
#367														mor #36	7											
													L													
			note boundorfes between s						ol. one may occur due to conditions	Page 1 of 1	o.: BB-CLTS-						note bouncorfee between						may excur due to constitions either	Poge 1 of 1 Boring No.		_

Drti	ler:		S.W. Cole		EI	wat T <b>a</b>	1 (f1	1.1	269	.4	Auger 1D/00:	5" Spird Ste	7 · 00
Opere	at <b>o</b> r:		Hanscom/Wal	I	Da	um			NAV	88	Sompler:	Standard Spi	
	ed By: Start/		N. Pukay 1/8/2024: 0	8:45-11:00		Type:		ned:		er Toh	0-50 Hammer Wt./Fall: or Bering Core Barrel:	140#/30" NG-2"	
Bort	ng Loca	rt Ten:	12+43.6, 6.	2 ft Lt.	Car	iling ((	/00:			1.0"/4		13.0 ft bgs.	
Hamm Deffn	er Eff1	stensy Fo	ster: 1.066	R - Regk	Hor Core Se	mer Ty	/pe:		Automo	Peck/R	HydraulTo □ Rope & Cotheod □  Reided Ffeld Vene Undrofned Sheor Strength (peffTy- Per	oket Torvone Sheor	Strength (pef)
0 = So MD = U U = Tr MU = U V = F	o I P+ Speci Insuccess Insuccess Teld Vanc Insuccess	er Sample oful Spift S Tube Sample oful Thin Va a Shear Teet oful Field V	peer Semple At	R = Reck. SSA = Sel tempt			omer or c	ios Tn	S <sub>ul</sub> I Q <sub>b</sub> " N-un Home Nso Nso	uncent uncent serrect er Effit SPT N	Wydrau i To L	Seter Centent, pa Liquid Limit Plastis Limit P1 - Plastisity I irein Siza Analysi arasilidetter Tast	raant Index S
		Ê		Sample Information	8		Г			ł			Laboratory
Depth (ft.)	Sample No.	en./Rec.	Sample Depth	Blows (/6 fr Shear Strength (psf) or R00 (%)	4-uncorrecte	Neo	Seating	Blows	Elevation (ft.)	Graphto Leg	Vfsual Descrip÷ion and Remarka		Testing Results/ AASHTO and hiffed Class
0							SS		268.7		9" HMA.	0.8	
							П			₩			
							П	Г		₩			
							П			₩			
										₩			
5 -	10	24/10	5.00 - 7.00	11/20/20/11	40	71				₩	Brown, moist, very dense, SAND, some growstit, (Fill).	ol. ITHHIO	
							П	Г		₩			
							П	Г		₩			
							П			₩			
							П	Г		₩			
10 -	20	24/8	10.00 -	6/6/5/15	11	20	П	Г		₩	Similar to 10, except medium dense.		
							1	7		₩			
							١١	/		₩			
							4	5 5	256.4	龖		13.0	1
							1			Ш			#318503 pH=5.27
15 -	3D	24/14	15.00 - 17.00	WOH/WOH/4/40	4	7	R	ŀ		Ш	Grey, wet, medium stiff, SILT, some sand, trace gravel, (Marsh Deposits).	trace clay.	Rosfatīvīty 1.864 ohm-ci
			17.00				H	H	252.9	Ш		16.5	
	40	3/3	17.00 -	50(3")	_		Н	$\vdash$			Grey, wet, hard, Gravelly SILT, same sand	(Glasta)	
			17-25				Н	$\vdash$	251.3	DIK!	Top of Bedrock at Elev. 251.3 ft. Roller Coned ahead to 19.2 ft bgs.	18-1-	ł
	R1	50.4/ 50.4	19.20 - 23.40	ROD = 85%			NO	/			Roller Coned ahead to 19.2 ft bgs.		#318503
20 -		50.4	23.40				1	Ė			Ris Light gray to dark gray, fine to made all partity colorocaus, olikariacce, interbedia countaint legens of MEXISTISTICS and less additionable control to gray of MEXISTISTISTIC and less adjoint plants, clearly spood, films Ridge Formation Rock businty = Good Rock	m-grafned- ed with	#318503 19.25-19.62 qp=23.452 pa1
							Н	H			SLATE. moderately hard, fresh, moderately dipping foints, closely spaced.	to steeply	"
	_	-					Н	H			[Flume Ridge Fermation] Rock Quality = Good		
	R2	36/34	23.40 -	ROD = 80%			Н	$\vdash$			H1: Core Times (minisec) 19.2-20.2 ft (3:29) 20.2-21.2 ft (3:28)		
	142	30,34	26.40	NGD - 00%			Н	$\vdash$			21.2-22.2 ft (3:27) 22.2-23.2 ft (5:26)		
25 -							Н	H					
	R3	33.6/29	26.40 -	RQD = 85%			Н	H			R2: Bedrock: Sīmījar to R1, except fīne-g [Fiume Rīdge Formatīon]	arned.	
	-	3310723	29.20	1145 - 054			Н	$\vdash$			R2: Bedrock: Stell or to R1. except fine-g [Flume Ridge Formstron] R24. Lore 1 Time: (Mineseo) 23.4-24.2 ft (3:05) 24.2-25.2 ft (3:45) 25.2-26.2 ft (3:45) 26.2-26.4 ft (2:05) 947. Recovery		
	$\vdash$					_	1	/			24.2-25.2 f+ (3:45) 25.2-26.2 f+ (3:54)		
	$\vdash$						Н	ν_	240.2		26.2-26.4 ft (2:05) 94% Recovery		
30 -							H				R3: Bedrook: STMTior to R1. [Flume Ridge Formation] Rook Quality = Good R3: Core Times (min:sec)		
							H				Rock Guality = Good R3: Core Times (min:sec)		
	$\vdash$						+				26.4-27.2 ff (3:05) 27.2-28.2 ff (3:54) 28.2-29.2 ff (4:05) 86% Racovery:		
	$\vdash$	-			$\vdash$		+	_					
	$\vdash$	-					+				6" of care left in hole Battom of Exploration at 29.2 feet below gr	ound surface.	
35 -							$\vdash$						
	$\vdash$						+						
	$\vdash$						$\vdash$	_					
	$\vdash$						$\vdash$	_					
	-	-					$\vdash$	_					
40 -		-					$\vdash$						
	$\vdash$	-					$\vdash$						
	$\vdash$	-					$\vdash$						
	$\vdash$	-					+						
	$\vdash$	-					$\vdash$	_					
45 -							$\vdash$						
							$\vdash$						
	$\vdash$						$\vdash$						
	<u> </u>	-					$\vdash$	_					
	<u> </u>	-					$\vdash$	_					
50 Remo	rks:									L			l
	mor#36	57											



STATE OF MAINE
DEPARTMENT OF TRANSPORTATION
2538700 WIN 25387.00 BRIDGE NO. 2472 P.E. NUMBER PROJ. MANAGER
J. STETSON
BY
CHECKED-REVIEWED
BESIGN-DET MALED
DESIGNADE TRAINED
DESIGNADE TRAINED
DESIGNADE TRAINED
REVISIONS
REVISIONS COUNTY TOMAH BRIDGE TOMAH STREAM WASHINGTON SDOT BORING LITTLE CODYVILLE SHEET NUMBER

5

OF 5

# Appendix A

Boring Logs

N	- 1aine	Depa	artment (	of Transporta	ation	ſ	Project		Γomah Bridge #2472 carries Route 6	Boring No.:	BB-CLT	`S-101
		<u> </u>	Soil/Rock Explo US CUSTOMA	oration Log			Locatio		ittle Tomah Stream vville Township, Maine	WIN:	2538	87.00
Drillir	ng Cont	ractor:	MaineDOT		Eleva	 ation	(ft.)	270.	3	Auger ID/OD:	5" Solid Stem	
Opera	ator:		Wilder/Daggett	t	Datur	m:		NAV	TD88	Sampler:	Standard Split	Spoon
Logg	ed By:		N. Pukay		Rig T	ype:		CMI	E 45C	Hammer Wt./Fall:	140#/30"	
Date	Start/Fir	nish:	10/12/2022; 08:	:00-11:00	Drillir	ng M	ethod:	Case	d Wash Boring	Core Barrel:	NQ-2"	
	g Locat		11+65.8, 7.3 ft		Casin				4.0"/4.5")	Water Level*:	11.0 ft bgs	
S = Sar B = Bud MD = U U = Thi MV = U	mple off Aucket Samp Insuccessf in Wall Tub Insuccessf	be Sample ful Field Var	s r Flights oon Sample Attemp ne Shear Test Atte PP= Pocket Pene	RC = Roller C empt WOH = Weigh etrometer WOR/C = Wei	re Sample Stem Auger v Stem Aug Cone ht of 140lb.	r jer . Hamn	mer	nple Attern	ot WO1P = Weight of 1 Person $S_U = Peak/Remolded Field Vane Ur S_{U(lab)} = Lab \ Vane \ Undrained Shea q_p = Unconfined \ Compressive \ Strer \ N-value = Raw Field \ SPT \ N-value \ T_V = Pocket \ Torvane \ Shear \ Strength \ WC = Water \ Content, \ percent \ \underline{z} = S$	ar Strength (psf) gth (ksf) n (psf)	LL = Liquid Lim PL = Plastic Lin PI = Plasticity Ir G = Grain Size C = Consolidati	nit ndex Analysis
				Sample Information			$\top$					Laboratory
Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log		ption and Remarks		Testing Results/ AASHTO and Unified Class.
$\begin{bmatrix} 0 \end{bmatrix}$						SSA	269.	<sup>7</sup> ×××	7" HMA.		0.6-	
- 5 -							] - - -					
[ , ]	1D	24/19	5.00 - 7.00	15/16/17/41	33		7		Brown, dry, very dense, Gravelly S	SAND, trace silt, (Fill).		G#337517 A-1-a, SW-SM
						+			Occasional cobble.			WC=5.4%
10						$\underline{\mathbb{V}}$				n name and an a		
"	2D	24/22	10.00 - 12.00	16/14/13/15	27	69			Dark brown, dry, dense, Gravelly S	SAND, little silt, trace org	anics, (Fill).	
[						59	7					
			+ +			27	1					
		<del>                                     </del>	+				$\dashv$					
		<u> </u>	1		$\rightarrow$	21	4					
- 15 -						18	_					
15	3D	24/5	15.00 - 17.00	4/3/5/11	8	11			Grey-brown, wet, medium dense, C	GRAVEL, trace silt, (Fill)		
						17	7					
		$\vdash$	+ +			80	253.	1	PEAT in wash at 17.0 ft bgs.		17.0	
		<del> </del>	+				-				17.2-	
		<u> </u>	1			97	4					
20						76			CP AVE		***	
[ 20	4D	24/14	20.00 - 22.00	14/15/15/23	30	43	]		Grey, wet, dense, GRAVEL, some	sand, trace silt, (Glacial	Γill).	G#337518 A-1-a, GW-
						69	1					GM WC=8.5%
			+ +			201	$\dashv$					
		<del> </del>	+	<del></del>			-					
		<u> </u>	1		$\rightarrow$	224	4		a175 blows for 0.5 ft.			
25						a175	245.	8 <b>[HIII</b>	41/5 blows for 0.5 ft.		24.5	
Stratific	Barrel b	s represent a	approximate bound	cel shell of core barrel le	ransitions r	may be	e gradual.			Page 1 of 2		
		-	been made at times ime measurements	es and under conditions state s were made.	ed. Ground	dwater	r fluctuatio	ons may o	ccur due to conditions other	Boring No.	.: BB-CLTS	5-101

than those present at the time measurements were made.

N	<b>Taine</b>	_	artment (		-	ation	l P	roject:	Little	Tomah Bridge #2472 carries Route 6 Little Tomah Stream	Boring No.:	BB-CL1	<u>S-101</u>
			Soil/Rock Expl US CUSTOMA		-		L	ocatior		yville Township, Maine	WIN:	2538	37.00
Drillin	ng Cont	ractor:	MaineDOT			Elev	vation (	ft.)	270.	3	Auger ID/OD:	5" Solid Stem	
Opera	ator:		Wilder/Dagget	ıt		Dat	um:		NAV	VD88	Sampler:	Standard Split	Spoon
Logg	ed By:		N. Pukay			Rig	Type:		CMI	E 45C	Hammer Wt./Fall:	140#/30"	
Date	Start/Fi	nish:	10/12/2022; 08	3:00-11:00		Dril	ling Me	thod:	Case	ed Wash Boring	Core Barrel:	NQ-2"	
	g Locat		11+65.8, 7.3 ft	Lt.			ing ID/0			(4.0"/4.5")	Water Level*:	11.0 ft bgs	
S = Sai B = Bud MD = U U = Thi MV = U	mple off Ai cket Samp Insuccessi in Wall Tul	oe Sample ful Field Var	s r Flights oon Sample Attem ne Shear Test Atte PP= Pocket Pen	empt	MU = Unsucc R = Rock Cor SSA = Solid S HSA = Hollow RC = Roller C WOH = Weig WOR/C = We	e Sample Stem Aug Stem A Cone ht of 140	e ger uger lb. Hamme	er .	ole Attem	pt WO1P = Weight of 1 Person $S_u = \text{Peak/Remolded Field Vane Ur}$ $S_u( ab) = \text{Lab Vane Undrained Shea}$ $q_p = \text{Unconfined Compressive Strer}$ $N$ -value = Raw Field SPT $N$ -value $T_v = \text{Pocket Torvane Shear Strengt}$ $WC = \text{Water Content}$ , $p = \text{content}$ $p = \text{content}$	ar Strength (psf) gth (ksf) n (psf)	LL = Liquid Lim PL = Plastic Lin PI = Plasticity Ir G = Grain Size C = Consolidati	nit ndex Analysis
Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)		Surengin (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Graphic Log		ption and Remarks		Laboratory Testing Results/ AASHTO and Unified Class
25	R1	60/60	25.20 - 30.20	RQD =			NQ-2			Top of Bedrock at Elev. 245.8 ft. Roller Coned ahead to 25.2 ft bgs.			
- 30 -								240.1		R1: Bedrock: Light to dark grey, v calcareous, GRAYWACKE, intert METASILTSTONE and lesser am moderately dipping joints, closely [Flume Ridge Formation] Rock Quality = Fair R1: Core Times (min:sec) 25.2-26.2 ft (1:50) 26.2-27.2 ft (1:40) 27.2-28.2 ft (3:09) 28.2-29.2 ft (2:09) 29.2-30.2 ft (2:59) 100% Recovery	redded with abundant layer ounts of SLATE, moderate spaced.	rs of	
- 35 -										Note: Core barrel broke during R1 barrel left in hole at 23.2-30.2 BGS Bottom of Exploration at	S (El. 247.1 to El. 240.1).	-30.2-	
- 40 - - 45 -													
50 Rema			DI C			0::5							
Core	Barrel b	roke durir	ig K1. Outer ste	el shell of c	core barrel le	tt in ho	le at 23.2	2-30.2 ft	bgs (El	. 247.1 - El. 240.1)			
Stratific	cation lines	represent	approximate boun	idaries betwe	en soil types; t	ransition	s may be	gradual.			Page 2 of 2		
		-	been made at time me measurements		conditions stat	ed. Gro	undwater f	fluctuatior	ns may o	ccur due to conditions other	Boring No.:	BB-CLTS	-101

N	<b>Iaine</b>	Depa	artment	of Transporta	ation	F	roject		Tomah Bridge #2472 carries Route 6	Boring No.:	BB-CLT	TS-102
			Soil/Rock Exp JS CUSTOM/			L	ocatio.		.ittle Tomah Stream yville Township, Maine	WIN:	2538	87.00
Drillir	ıg Conti	actor:	MaineDOT		Elevat	ion (	(ft.)	269.	6	Auger ID/OD:	5" Solid Stem	
Opera			Wilder/Dagge	ett	Datum		,		/D88	Sampler:	Standard Split	Spoon
Logge	ed By:		N. Pukay		Rig Ty	pe:		CMI	E 45C	Hammer Wt./Fall:	140#/30"	-
Date	Start/Fir	nish:	10/11/2022; 1	0:45-14:00	Drilling	g Me	thod:	Case	ed Wash Boring	Core Barrel:	NQ-2"	
Borin	g Locat	ion:	12+33.2, 6.9 f		Casing				(4.0"/4.5")	Water Level*:	16.0 ft bgs	
S = Sar B = Bud MD = U U = Thi MV = U	nple off Au ket Samp nsuccessf n Wall Tub	e Sample ul Field Var	Flights  on Sample Atten  ne Shear Test Att  PP= Pocket Per	RC = Roller C tempt WOH = Weigi	re Sample Stem Auger v Stem Auge Cone ht of 140lb. I	r Hamm	ıer	nple Attern	pt WO1P = Weight of 1 Person S <sub>u</sub> = Peak/Remolded Field Vane Ur Su(lab) = Lab Vane Undrained Shea q <sub>p</sub> = Unconfined Compressive Strer N-value = Raw Field SPT N-value T <sub>v</sub> = Pocket Torvane Shear Strengtl WC = Water Content, percent ≥ = S	ar Strength (psf) gth (ksf)	LL = Liquid Lim PL = Plastic Lir PI = Plasticity I G = Grain Size C = Consolidat	nit ndex Analysis ion Test
Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Blows	Elevation (#)	Graphic Log		ption and Remarks		Laboratory Testing Results/ AASHTO and Unified Class.
$\begin{bmatrix} 0 \end{bmatrix}$					S	SSA			11" HMA.			
- 5 <del>-</del>	1D	24/20	5.00 - 7.00	12/17/20/17	37		- 268. - -	7	Brown, dry, very dense, SAND, so	me gravel, little silt, (Fill	0.9	G#337519 A-1-b, SM
- 10 -	2D	24/18	10.00 - 12.00	4/4/5/5		16 17 16	-		Brown, moist, medium dense, SAN (Fill).	∛D, some silt, some grave	l, trace clay,	WC=5.0%  G#337520 A-2-4, SC-SM WC=13.9%
l †						0	256.				13.0	
						8	-					
- 15 -	3D	24/15	15.00 - 17.00	2/WOR/WOR/WOR		9	-		Grey, wet, very soft, SILT, some s. Deposits).	and, trace clay, trace grav	el, (Marsh	G#337521 A-4, CL
l							1		Deposits).			WC=33.9%
						11			Dark brown PEAT observed in wa	sh at 17.0 ft bgs.		Non-Plastic
						14						
						20						
20	410	0.4/1.4	20.00. 22.00	2/4/12/16	1.7	10	┨					
	4D	24/14	20.00 - 22.00	3/4/13/16	17	40	┨					
						61	248.	3	4D: Grey, wet, medium dense, SA	ND, some gravel, little sil	t, trace peat,	G#337522
li						75	1		(Glacial Till).	-	-	A-1-B, SW- SM
l							-					WC=14.1%
						74	4					
25						70						
Rema	ation lines	•		ndaries between soil types; t		•	-		cour due to conditions other	Page 1 of 2		

than those present at the time measurements were made.

Boring No.: BB-CLTS-102

N	<b>Taine</b>	Depa	artment	of Transporta	tion	F	Project:	Little '	Готаh Bridge #2472 carries Route 6	Boring No.:	BB-CLT	S-102
		-	Soil/Rock Expl	-		١,	ocatio		ittle Tomah Stream yville Township, Maine			
		Ţ	JS CUSTOMA	RY UNITS			.ocatio	n. cou	yvine Township, Maine	WIN:	2538	87.00
Drillii	ng Conti	ractor:	MaineDOT		Eleva	tion (	ft.)	269.	6	Auger ID/OD:	5" Solid Stem	
Opera			Wilder/Dagget	t	Datun		,	NAV	/D88	Sampler:	Standard Split	Spoon
<u> </u>	ed By:		N. Pukay		Rig T	/ne:			E 45C	Hammer Wt./Fall:	140#/30"	
	Start/Fir		10/11/2022; 10	)·45-14·00	Drillin		thod:		d Wash Boring	Core Barrel:	NQ-2"	
$\vdash$	g Locat		12+33.2, 6.9 ft		Casin	_			(4.0"/4.5")	Water Level*:	16.0 ft bgs	
Definiti	ons: D =	Spilt Spoor	Sample	MU = Unsucce					pt WO1P = Weight of 1 Person		10.0 H 0g3	
		iger Flights e off Auger		R = Rock Core SSA = Solid St					S <sub>u</sub> = Peak/Remolded Field Vane Un S <sub>u(lab)</sub> = Lab Vane Undrained Shea		LL = Liquid Lim	i <del>t</del>
MD = U	Jnsuccessf	ul Split Spo	on Sample Attem	pt HSA = Hollow	Stem Auge	er			qp = Unconfined Compressive Stren	gth (ksf)	PL = Plastic Lin	nit
	in Wall Tub Insuccessf		ne Shear Test Atte	RC = Roller Co empt WOH = Weight		Hamm	er		N-value = Raw Field SPT N-value T <sub>v</sub> = Pocket Torvane Shear Strength	ı (psf)	PI = Plasticity II G = Grain Size	
V = Fie	ld Vane Sh	ear Test,	PP= Pocket Pen	etrometer WOR/C = Weig					WC = Water Content, percent ≅ = S	imilar or Equal too	C = Consolidati	
				Sample Information								Laboratory
	o o	Pen./Rec. (in.)	Depth	Blows (/6 in.) Shear Strength (psf) or RQD (%)				go				Testing Results/
Depth (ft.)	e No.	ec.	e D	(/6	<u>υ</u>	_	Elevation (ft.)	Graphic Log	Visual Descri	ption and Remarks		AASHTO
pth	Sample I	n./F	Sample (ft.)	ows ear eng eng sf) RQ	N-value	Casing Blows	svat (	aph				and
	Sa	Pe	Sa (#	<u> </u>	ź	<u>පු ප</u>	ı≝∈					Unified Class.
25	5D	24/14	25.00 - 27.00	11/23/33/37	56	62		1	Grey, wet, very dense, Sandy GRA	VEL, some silt, (Glacial T	ill).	
						69						
						86						
						96		<b>.</b> (				
						121		2 4 8				
- 30 -	6D	24/18	30.00 - 32.00	40/59/47/48	106	47	1		Grey, wet, very dense, GRAVEL, s	some silt, some sand, (Glad	ial Till).	
	UD U	24/16	30.00 - 32.00	40/33/47/48	100		1					
						48	1					
						85	-					
						110	-					
- 35 -						111	1		a55 blows for 5".			
	7D 	5/1 60/60	35.00 - 35.42 35.40 - 40.40	RQD = 70%	1	a <b>5</b> 5 ₩ <del>Q-2</del>	234.2		Grey, wet, very dense, GRAVEL (I	Bedrock), trace silt.	35.4-	
									Top of Bedrock at Elev. 234.2 ft. R1: Bedrock: Light to dark grey, vo	ery fine to medium-grained	l, slightly	
									calcareous, GRAYWACKE, interb METASILTSTONE and lesser amo	edded with abundant layer	s of	
							1		moderately dipping joints, spaced		ry nara, mesn,	
							1		[Flume Ridge Formation] Rock Quality = Fair			
- 40 -									R1: Core Times (min:sec)			
40	R2	60/60	40.40 - 45.40	RQD = 83%					35.4-36.4 ft (1:45)			
							1		36.4-37.4 ft (1:47) 37.4-38.4 ft (2:00)			
									38.4-39.4 ft (1:55)			
									39.4-404 ft (3:10) 100% Recovery			
							-		•			
									R2: Bedrock: Similar to R1, except fractures.	with several quartz or cal-	cite annealed	
						1/			[Flume Ridge Formation]			
- 45 -						$\forall$	224.2	,	Rock Quality = Good R2: Core Times (min:sec)			
							224.2		40.4-41.4 ft (1:28)			
									41.4-42.4 ft (1:47)			
							1		42.4-43.4 ft (1:20) 43.4-44.4 ft (1:24)			
									44.4-45.4 ft (1:29)			
							1		100% Recovery		<del>45.4</del>	
							1		Bottom of Exploration at	45.4 feet below ground so		
Rema	arks:							1				ļ.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

\* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Page 2 of 2

Boring No.: BB-CLTS-102

N		Depa	artment (	of Tra	nsport							Boring No.:	BB-CLT	S-201
			Soil/Rock Explo		•			Lo	cation		ittle Tomah Stream yville Township, Maine		2520	27.00
		Ē	JS CUSTOMA	RY UNITS	3						-	WIN:	2538	87.00
Drillin	ıg Cont	ractor:	S.W. Cole			Elev	/atio	n (ft	i.)	270.:	5	Auger ID/OD:	5" Solid Stem	
Opera	ator:		Hanscom/Wall	ι		Datu				NAV		Sampler:	Standard Split	Spoon
<b>─</b> ─	ed By:		N. Pukay				Туре				rich D-50	Hammer Wt./Fall:	140#/30"	
$\vdash$	Start/Fir		1/8/2024; 11:30				ling I				d Wash Boring	Core Barrel:	NQ-2"	1
Definition		Spilt Spoon		Lt.	MU = Unsucc	cessful Thi						Water Level*:	None Observed	1
S = Sar	mple off Au	uger Flights ble off Auger	,		R = Rock Cor SSA = Solid S	re Sample	Э				S <sub>u</sub> = Peak/Remolded Field Vane Ur S <sub>u(lah)</sub> = Lab Vane Undrained Shea	ar Strength (psf)	LL = Liquid Limi	
MD = U U = Thi	Insuccessf n Wall Tub	ful Split Spo be Sample	oon Sample Attemp	•	HSA = Hollow RC = Roller C	w Stem Au					q <sub>p</sub> = Unconfined Compressive Strer N-value = Raw Field SPT N-value	ngth (ksf)	PL = Plastic Lim PI = Plasticity Ir	nit
MV = U	nsuccessf	ful Field Van	ne Shear Test Atte PP= Pocket Pene		WOH = Weigl WOR/C = We						$T_V$ = Pocket Torvane Shear Strengtl WC = Water Content, percent $\cong$ = S		G = Grain Size C = Consolidation	Analysis
		1	S	Sample In	formation									Laboratory
		(in.)	Sample Depth (ft.)	( u	(%)					l gc				Testing Results/
(E)	e No	ec.	<u>e</u> De	. 9/)	# (%   D	<u>a</u>	D		ioi I	lic Lc	Visual Descri	ption and Remarks		AASHTO
Depth (ft.)	Sample No	Pen./Rec. (in.)	ldme (:)	ows	Strength (psf) or RQD (%)	N-value	Casing	ows	Elevation (ft.)	Graphic Log				and Unified Class.
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20	R1	36/36	20.50 - 23.50	ROD	= 69%		RC	2_	250.5		Top of Bedrock at Elev. 250.5 ft.		20.0	
	Kı	30/30	20.30 - 23.30	- KQL	- 0970	$\vdash$	NQ.		l		Roller Coned ahead to 20.5 ft bgs. R1: Bedrock: Light grey to dark gr	ov. fine to medium_graine	A clichtly	
							$\perp$	_	l		calcareous, GRAYWACKE, interb	edded with abundant laye	ers of	
				ı					I		METASILTSTONE and lesser am moderately to steeply dipping joint		ely hard, fresh,	
	R2	24/20	23.50 - 25.50	RQD	= 33%		$\top$	$\exists$			[Flume Ridge Formation]	, C		
							+	$\dashv$			Rock Quality = Fair R1: Core Times (min:sec)			
25 Bomo	J						$\perp$	$\perp$			20.5-21.5 ft (3:02)			
Rema	i <b>rks:</b> mer #367	7												
Наш	mer #50/	1												
Stratific	ation lines	s represent	approximate bound	ndaries betwe	en soil types; f	transitions	may	be gr	radual.			Page 1 of 2		
* Water	level reac	dings have l	been made at time	es and under	conditions sta	ted. Grou	ındwa'	ter flu	uctuation	is may o	ccur due to conditions other			
		-	me measurements							,		Boring No.	.: BB-CLTS	-201

N	<b>Tain</b>	e Depa	rtment	of Transporta	<b>Project:</b> Little Tomah Bridge #2472 carries Route over Little Tomah Stream					Boring No.:	BB-CLT	S-201	
			oil/Rock Exp IS CUSTOM	•		Loca			ittle Tomah Stream yville Township, Maine	WIN:	2538	37.00	
D=1111	C		C.W. C.1.		Florestic	- (ft )		270	e	August ID/OD:	511 G - 1: 1 G+		
Opera			S.W. Cole Hanscom/Wal	1	Elevation:	on (it.)		270.	7D88	Auger ID/OD: Sampler:	5" Solid Stem Standard Split	Snoon	
<u> </u>	ed By:		N. Pukay	.1	Rig Typ	٥.			rich D-50	Hammer Wt./Fall:	140#/30"	<u>эроон</u>	
	Start/Fi		1/8/2024; 11:3	20.12:00	Drilling		٠d٠		d Wash Boring	Core Barrel:	NQ-2"		
-	ig Loca		11+53.9, 6.1 f		Casing				(4.0"/4.5")	Water Level*:	None Observed	4	
Definition	ons: D =	Spilt Spoor			essful Thin Wa				pt WO1P = Weight of 1 Person		None Observed	+	
B = Bud MD = U U = Thi MV = U	cket Samp Insuccess in Wall Tu Insuccess	be Sample ful Field Var	Flights on Sample Atten e Shear Test Att PP= Pocket Per	RC = Roller C tempt WOH = Weig	Stem Auger Stem Auger				$\begin{array}{lll} S_u = \text{Peak/Remolded Field Vane U} \\ S_U(\text{lab}) = \text{Lab Vane Undrained Shet} \\ q_p = \text{Unconfined Compressive Strer} \\ \text{N-value} = \text{Raw Field SPT N-value} \\ T_V = \text{Pocket Torvane Shear Strengt} \\ \text{WC} = \text{Water Content, percent} \geq = \text{S} \end{array}$	ar Strength (psf) ngth (ksf) h (psf)	LL = Liquid Lim PL = Plastic Lin PI = Plasticity Ir G = Grain Size C = Consolidati	nit ndex Analysis	
				Sample Information								Laboratory	
Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value Casing		(ft.)	Graphic Log	Visual Descr 21.5-22.5 ft (3:15)	iption and Remarks		Testing Results/ AASHTO and Unified Class.	
- 30 - - 35 - - 40 -	arks.						45.0		22.5-23.5 ft (3:28) 100% Recovery  R2: Bedrock: Light grey to dark gt calcareous, GRAYWACKE, intert METASILTSTONE and lesser am steeply dipping joints, closely spac [Flume Ridge Formation] Rock Quality = Poor R2: Core Times (min:sec) 23.5-24.5 ft (3:26) 24.5-25.5 ft (3:38) 83% Recovery  Bottom of Exploration at	bedded with abundant laye ounts of SLATE, moderat ed.	rs of ely hard, fresh,		
Rema		7											
Ham	Hammer #367												
Stratific	cation lines	s represent a	approximate bou	ndaries between soil types; t	ransitions may	be grad	lual.			Page 2 of 2			
		-	een made at tim ne measuremen	es and under conditions stat ts were made.	ed. Groundwa	ater flucti	uations	s may o	ccur due to conditions other	Boring No.	: BB-CLTS	-201	

N	<b>Iaine</b>	Dep	artment (	of Transporta	ation	. F	roject		Tomah Bridge #2472 carries Route 6	Boring No.:	BB-CLT	S-202
		_	Soil/Rock Explo	-			ocatio		ittle Tomah Stream yville Township, Maine			
		ļ	US CUSTOMA	RY UNITS		l'	-ocalio	n. Cou	yvine Township, Maine	WIN:	2538	87.00
<u></u>			aw a 1		1		(6) \	270	,	4	511.0 11.1.0	
		ractor:	S.W. Cole		+	ation (	π.)	270.		Auger ID/OD:	5" Solid Stem	
Opera			Hanscom/Wall		Datu				/D88	Sampler: Hammer Wt./Fall:	Standard Split	Spoon
<del></del>	ed By:		N. Pukay	. 11 15	+	Type:	411-		Irich D-50		140#/30"	
	Start/Fi	_	1/9/2024; 08:45		+	ing Me			ed Wash Boring	Core Barrel: Water Level*:	NQ-2"	
	g Locat	Spilt Spoo	11+53.9, 7.0 ft n Sample	MU = Unsucc		ing ID/ in Wall T			(3.0"/3.5") pt WO1P = Weight of 1 Person	water Level :	11.0 ft bgs.	
S = Sa	mple off A	uger Flights le off Auge		R = Rock Cor SSA = Solid S	e Sample	•			S <sub>u</sub> = Peak/Remolded Field Vane Ur S <sub>u(lab)</sub> = Lab Vane Undrained Shea		LL = Liquid Lim	.i+
MD = U	Insuccessi	ful Split Spo	oon Sample Attem	ot HSA = Hollow	Stem Au				q <sub>p</sub> = Unconfined Compressive Stren	ngth (ksf)	PL = Plastic Lir	nit
MV = L	Insuccessi		ne Shear Test Atte		nt of 140I				N-value = Raw Field SPT N-value T <sub>V</sub> = Pocket Torvane Shear Strength		PI = Plasticity I G = Grain Size	Analysis
V = Fie	ld Vane SI	near Test,	PP= Pocket Pene	ample Information	ight of Ro	ods or Ca	sing		WC = Water Content, percent ≅ = S	Similar or Equal too	C = Consolidat	on Test
		-		•								Laboratory
	<u>o</u>	. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)				Log	Vieual Deseri	intion and Domonics		Testing Results/
) (ff.	<u>e</u>	Rec	<u>e</u>	gth	e	۵ <u>«</u>	Ē	i	Visual Descri	ption and Remarks		AASHTO
Depth (ft.)	Sample No.	Pen./Rec.	amp	lows hear tren tren ssf)	N-value	Casing Blows	Elevation (ft.)	Graphic				and Unified Class.
0	ιÿ	ď	, ÿ €	<u> </u>	Ż	Ο M	│ <u></u> □ €	Ŋ	10" HMA.			
						SSA	269.8	xxxxx	10 filia.		0.8	
								$\bowtie$				
							1					
							_	$\bowtie$				
							1	$\bowtie$				
- 5 -							_		D 1 GAND	1 15:1 15:0	.415	
	1D	24/10	5.00 - 7.00	15/16/21/14	37			$\bowtie$	Brown, moist, very dense, SAND,	some gravei, little siit, (F	111).	
							1	$\bowtie$				
							4	$\bowtie$				
								$\bowtie$				
							1					
							-	$\bowtie$				
10 -								$\bowtie$			_	
10	2D	24/9	10.00 - 12.00	16/11/10/7	21			$\bowtie$	Similar to 1D, except dense. Mater	ial change observed in tip	o of spoon.	
							1	$\bowtie$				
							258.0				12.0	
									Material on auger flights from 12.0 trace gravel, (Marsh Deposits).	0-15.0 ft bgs: Brown, wet	, Silty SAND,	
						\ /	1		trace graver, (marsh Deposits).			
						+	1					
- 15 -						$\mathbb{V}$	_					
13	3D/A	24/12	15.00 - 17.00	8/9/9/11	18	9			3D (Top 3") Brown, wet, dense, S	ilty SAND, little gravel, (	Marsh Deposits).	
						27	254.0		2D/A (Bottom 0") Croy brown wa	ot danca SAND sama s	16.0	
						27	4	*	3D/A (Bottom 9") Grey-brown, we (Glacial Till).		iavei, suille siil,	
	4D	13.2/8	17.00 - 18.10	12/29/50(1.2"))		39			Brown, wet, Sandy SILT, little gra	vel, (Glacial Till).		
	R1	60/60	18.10 - 23.10	RQD = 48%		a25	252.:	D.G.L.K.I.	a25 blows for 0.1 ft.		18.1-	
				`		NQ-2	1		Top of Bedrock at Elev. 252.5 ft.	·		
20 -									R1: Bedrock: Light grey to dark gr calcareous, GRAYWACKE, interb			
20									METASILTSTONE and lesser am	ounts of SLATE, modera	tely hard, fresh,	#318503
							1		steeply dipping joints, closely spac [Flume Ridge Formation]	ed, with some calcite infi	lling.	21.52-21.87
							4		Rock Quality = Poor			q <sub>p</sub> =5,451 psi
									R1: Core Times (min:sec) 18.1-19.1 ft (4:18)			
	R2	60/60	23.10 - 28.10	RQD = 83%			1		19.1-20.1 ft (3:37)			
							+		20.1-21.1 ft (3:35) 21.1-22.1 ft (4:04)			
25									22.1-23.1 ft (6:02)			
Rema												
Ham	mer #36'	7										
Stratific	ation lines	represent	approximate boun	daries between soil types; t	ransitions	may be	gradual.			Page 1 of 2		

**Boring No.:** BB-CLTS-202

Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other

than those present at the time measurements were made.

N	<b>Aaine</b>	Depa	artment	of Transpor	Ortation Project: Little Tomah Bridge #2472 carries Route over Little Tomah Stream					Boring No.:	BB-CLTS	5-202
			Soil/Rock Exp			Lo	cation		ittle Tomah Stream yville Township, Maine	34/151-	25205	7.00
		<u>.</u>	JS CUSTOM.	ARY UNITS						WIN:	25387	7.00
Drilli	ng Cont	ractor:	S.W. Cole		Elevation	on (ft.	.)	270.	6	Auger ID/OD:	5" Solid Stem	
Oper	ator:		Hanscom/Wal	11	Datum:			NAV	/D88	Sampler:	Standard Split S <sub>I</sub>	poon
<b>─</b> ─	ed By:		N. Pukay		Rig Typ			Died	rich D-50	Hammer Wt./Fall:	140#/30"	
	Start/Fi		1/9/2024; 08:4		Drilling				d Wash Boring	Core Barrel:	NQ-2"	
	ng Locat	tion: Spilt Spoo	11+53.9, 7.0 f		Casing ccessful Thin W				(3.0"/3.5") pt WO1P = Weight of 1 Person	Water Level*:	11.0 ft bgs.	
S = Sal B = Bu MD = U U = Th MV = U	mple off A cket Samp Jnsuccess in Wall Tul Jnsuccess	uger Flights ble off Auge ful Split Spo be Sample ful Field Va	r Flights pon Sample Atter ne Shear Test At PP= Pocket Per	R = Rock C   SSA = Solic   SSA = Solic   HSA = Holl   RC = Roller   tempt   WOH = We   netrometer   WOR/C = W	ore Sample I Stem Auger ow Stem Auger Cone ight of 140lb. Have	ammer		ic 7 thorn	S <sub>u</sub> = Peak/Remolded Field Vane Ur S <sub>u</sub> (lab) = Lab Vane Undrained She q <sub>p</sub> = Unconfined Compressive Stret N-value = Raw Field SPT N-value T <sub>V</sub> = Pocket Torvane Shear Strengt WC = Water Content, percent ≘ = S	ar Strength (psf) ngth (ksf) th (psf)	LL = Liquid Limit PL = Plastic Limit PI = Plasticity Ind G = Grain Size Ar C = Consolidation	ex nalysis
				Sample Information		_						Laboratory
Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value Casing	Blows	Elevation (ft.)	Graphic Log	Visual Descr	iption and Remarks	U	Testing Results/ AASHTO and Inified Class
- 30 -							242.5		R2: Bedrock: Similar to R1, excep [Flume Ridge Formation] Rock Quality = Good R2: Core Times (min:sec) 23.1-24.1 ft (6:02) 24.1-25.1 ft (4:03) 25.1-26.1 ft (3:05) 26.1-27.1 ft (2:54) 27.1-28.1 ft (3:10)	ot more competent.		
30									Bottom of Exploration at	28.1 feet below ground	28.1- surface.	
- 35 -												
- 40 -												
- 45 -												
_50												
Stratific	nmer #36	s represent		ndaries between soil types						Page 2 of 2		
		-	been made at tim me measuremen		tated. Groundw	ater flu	ctuation	s may o	ccur due to conditions other	Boring No.	: BB-CLTS-	202

N	<b>Iain</b>	<u> </u>	artment ( Soil/Rock Expl US CUSTOMA	_	ation			ittle Tomah Bridge #2472 carries Ro ver Little Tomah Stream Codyville Township, Maine	WIN:	BB-CLT	S-203 87.00
Drillir	na Conf	tractor:	S.W. Cole		Elevi	ation (1	(ft.)	269.4	Auger ID/OD:	5" Solid Stem	
Opera			Hanscom/Wall	1	Datu		,	NAVD88	Sampler:	Standard Split	Spoon
	ed By:		N. Pukay	<u>;                                    </u>	Rig T			Diedrich D-50	Hammer Wt./Fall:	140#/30"	<u> </u>
	Start/Fi	inish:	1/8/2024; 08:4	5-11:00		ing Me	thod:	Cased Wash Boring	Core Barrel:	NQ-2"	
	g Loca		12+43.6, 6.2 ft			ng ID/0		HW(4.0"/4.5")	Water Level*:	13.0 ft bgs.	
S = Sar B = Bud MD = U U = Thi MV = U	mple off A cket Samp Insuccess in Wall Tu Insuccess	ube Sample sful Field Var	r Flights oon Sample Attem ne Shear Test Atte PP= Pocket Pen	RC = Roller C tempt WOH = Weigl	ore Sample Stem Auger w Stem Aug Cone ght of 140lb.	er ger o. Hamme	ner		Strength (ksf) alue rength (psf)	LL = Liquid Lim PL = Plastic Lin PI = Plasticity Ir G = Grain Size C = Consolidati	nit ndex Analysis ion Test
Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value	Casing Blows	Elevation (ft.)	Oraphic Log	escription and Remarks		Laboratory Testing Results/ AASHTO and Unified Class
0						SSA		9" HMA.			
- 5 -							268.7	Brown, moist, very dense, SA	ND, some gravel, little silt, (Fi		
- 10 <del>-</del>	1D 2D	24/10	10.00 - 12.00	6/6/5/15	11	<u>+</u> +	- - - -	Similar to 1D, except medium	dense.		
- 15 <del>-</del>	3D	24/14	15.00 - 17.00	WOH/WOH/4/40	4	45 19 RC	256.4	Deposits).	ς, some sand, trace clay, trace ε		#318503 pH=5.27 Resistivity: 1,864 ohm-en
		<del> </del>			$\vdash$	_	252.9	Grey, wet, hard, Gravelly SIL	T some sand, (Glacial Till).	16.5	
	4D	3/3	17.00 - 17.25	50(3")		_	251.3			18.1-	
					i	$\perp$		Top of Bedrock at Elev. 251.3 Roller Coned ahead to 19.2 ft			
- 20 -	R1	50.4/50.4	4 19.20 - 23.40 23.40 - 26.40			NQ-2	- - - - - -	R1: Light grey to dark grey, f. GRAYWACKE, interbedded and lesser amounts of SLATE dipping joints, closely spaced [Flume Ridge Formation] Rock Quality = Good R1: Core Times (min:sec) 19.2-20.2 ft (3:29)	ine to medium-grained, slightly with abundant layers of META , moderately hard, fresh, mode	ASILTSTONE	#318503 19.25-19.62 qp=23,452 ps
	N2	30/37	23.40 - 20.40	KQD - 8070	+	+	-	20.2-21.2 ft (3:28) 21.2-22.2 ft (3:27)			
25		<u></u>			$oldsymbol{ol}}}}}}}}}}}}}}}}}}$			22.2-23.2 ft (5:26)			
	mer #36		approximate boui	ndaries between soil types; t	transitions	may be	gradual.		Page 1 of 2		

\* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Boring No.: BB-CLTS-203

N	Maine Department of Transportat  Soil/Rock Exploration Log						Р	roject:	Little '	Tomah Bridge #2472 carries Route 6	Boring No.:	BB-CLT	S-203
		<b>2</b>		_	ocation.		ittle Tomah Stream yville Township, Maine						
		Ţ	JS CUSTOMA	RY UNITS	<u> </u>					• •	WIN:	2538	37.00
Drilli	ng Cont	ractor:	S.W. Cole			Elevat	ion (	ft.)	269.	4	Auger ID/OD:	5" Solid Stem	
Oper	ator:		Hanscom/Wall			Datum	1:		NAV	/D88	Sampler:	Standard Split	Spoon
Logg	ed By:		N. Pukay			Rig Ty	pe:		Died	lrich D-50	Hammer Wt./Fall:	140#/30"	
-	Start/Fi		1/8/2024; 08:4:			Drillin				ed Wash Boring	Core Barrel:	NQ-2"	
	ng Loca	tion: Spilt Spoor	12+43.6, 6.2 ft	Lt.	MU = Unsucce	Casing				(4.0"/4.5") pt WO1P = Weight of 1 Person	Water Level*:	13.0 ft bgs.	
S = Sa B = Bu MD = U U = Th MV = U	mple off A cket Samp Jnsuccess in Wall Tu Jnsuccess	uger Flights ble off Auger ful Split Spo be Sample ful Field Var	Flights on Sample Attempte The Shear Test Atte PP= Pocket Pene	empt etrometer	R = Rock Core SSA = Solid S HSA = Hollow RC = Roller C WOH = Weigh WOR/C = Wei	e Sample Item Auger Stem Auge one nt of 140lb.	r Hamm	er	, contraction	S <sub>u</sub> = Peak/Remolded Field Vane Ur Su(lab) = Lab Vane Undrained Shes qp = Unconfined Compressive Strer N-value = Raw Field SPT N-value T <sub>v</sub> = Pocket Torvane Shear Strengtl WC = Water Content, percent ≘ = S	ar Strength (psf) ngth (ksf) n (psf)	LL = Liquid Lim PL = Plastic Lim PI = Plasticity Ir G = Grain Size C = Consolidati	nit ndex Analysis
				Sample Inf									Laboratory
25 Depth (ff.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear	Su'engui (psf) or RQD (%)	N-value	Blows	Elevation (ft.)	Graphic Log	Visual Descri	ption and Remarks		Testing Results/ AASHTO and Unified Class
23										100% Recovery			
- 30 -	R3	33.6/29	26.40 - 29.20	RQD =	= 85%	\	<u></u>	240.2		R2: Bedrock: Similar to R1, excep [Flume Ridge Formation] Rock Quality = Good R2: Core Times (min:sec) 23.4-24.2 ft (3:05) 24.2-25.2 ft (3:45) 25.2-26.2 ft (3:54) 26.2-26.4 ft (2:05) 94% Recovery	t fine-grained.		
								-		R3: Bedrock: Similar to R1. [Flume Ridge Formation] Rock Quality = Good R3: Core Times (min:sec) 26.4-27.2 ft (3:05) 27.2-28.2 ft (3:54) 28.2-29.2 ft (4:05) 86% Recovery;			
- 35 -										6" of core left in hole  Bottom of Exploration at	29.2 feet below ground s	29.2- urface.	
								-					
- 40 -								-					
- 45 -								-					
								- - -					
_50_	<u> </u>												
	nmer #36		approximate boun	idaries betwe	en soil types; tr	ansitions m	ay be	gradual.			Page 2 of 2		
			oeen made at time me measurements		conditions state	ed. Ground	water	fluctuatior	ns may o	ccur due to conditions other	Boring No.	: BB-CLTS	-203

N	<b>Aain</b>	<b>Dep</b>	artment	of Transpor	<b>Project:</b> Little Tomah Bridge #2472 carries Route 6					Boring No.:	BP-CLT	S-103
			Soil/Rock Exp US CUSTOM			Loc	ation		ittle Tomah Stream yville Township, Maine	WIN:	2538	37.00
Drillio	na Cont	ractor:	MaineDOT		Elevation	n (ft )	`	270.:	2	Auger ID/OD:	5" Dia.	
Opera		- aotori	Wilder/Dagge	ett	Datum:				/D88	Sampler:	N/A	
<u> </u>	ed By:		N. Pukay		Rig Typ				E 45C	Hammer Wt./Fall:	N/A	
_	Start/Fi	nish:	10/12/2022-10	0/12/2022	Drilling		od:		l Stem Auger	Core Barrel:	N/A	
Borin	ng Loca	tion:	11+74.9, 4.8 f	ft Lt.	Casing			N/A	<u> </u>	Water Level*:	None Observe	1
S = Sal B = Bu MD = U U = Th MV = U	mple off A cket Samp Jnsuccess in Wall Tu Jnsuccess	uger Flight ble off Auge ful Split Sp be Sample	er Flights poon Sample Atten e ane Shear Test Att PP= Pocket Per	R = Rock C SSA = Solid mpt HSA = Holld RC = Roller tempt WOH = We	ight of 140lb. Ha Veight of Rods o	ammer		le Attem	pt WO1P = Weight of 1 Person S <sub>U</sub> = Peak/Remolded Field Vane Uf Su(lab) = Lab Vane Undrained She q <sub>p</sub> = Unconfined Compressive Stret N-value = Raw Field SPT N-value T <sub>V</sub> = Pocket Torvane Shear Strengt WC = Water Content, percent ≥ = \$	ar Strength (psf) ngth (ksf) h (psf)	LL = Liquid Lim PL = Plastic Lin PI = Plasticity Ir G = Grain Size C = Consolidati	nit ndex Analysis
Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value Casing	Blows	Elevation (ft.)	Graphic Log	Visual Descr	iption and Remarks		Testing Results/ AASHTO and Unified Class.
0	Ø	ď	<u> </u>	<u> </u>			ш €	.υ 	Boring probe. Fill spoils observed	on auger flights.		
- 5 -				SS	5A							
- 10 -							258.4		Bottom of Exploration at REFUSAL. Concrete dust on auge	11.8 feet below ground s	11.8 surface.	
- 20 -												
25 <b>Rem</b> a	arks:											
				ndaries between soil types nes and under conditions si				s may o	ccur due to conditions other	Page 1 of 1	DD CV TC	102
than	those pres	ent at the	time measuremen	ts were made.						Boring No.: BP-CLTS-103		

N	<b>Iaine</b>	Dep	artment	of Transport						Boring No.:	BP-CLT	S-104
		•	Soil/Rock Exp US CUSTOM			Loc	catior		ittle Tomah Stream ville Township, Maine	WIN:	2539	37.00
			00 00010111	AICT OINTO						WIN.		57.00
Drillir	ng Cont	ractor:	MaineDOT		Elevation	- 1	.)	270.2		Auger ID/OD:	5" Dia.	
Opera			Wilder/Dagge	ett	Datum:			NAV		Sampler:	N/A	
	ed By:		N. Pukay		Rig Typ			CME		Hammer Wt./Fall:	N/A	
$\vdash$	Start/Fir		10/12/2022-10		Drilling				Stem Auger	Core Barrel:	N/A	1
	g Locat		11+74.9, 6.2 f		Casing cessful Thin W			N/A	ot WO1P = Weight of 1 Person	Water Level*:	None Observed	1
S = Sar B = Bud MD = U U = Thi MV = U	mple off Au cket Samp Insuccessf n Wall Tub	uger Fligh le off Aug ful Split Sp oe Sample ful Field V	is er Flights poon Sample Atter e ane Shear Test At PP= Pocket Per	R = Rock Co SSA = Solid mpt	ore Sample Stem Auger w Stem Auger	ammer		, and the state of	S <sub>U</sub> = Peak/Remolded Field Vane Ur S <sub>U</sub> (lab) = Lab Vane Undrained Sher q <sub>p</sub> = Unconfined Compressive Strer N-value = Raw Field SPT N-value T <sub>V</sub> = Pocket Torvane Shear Strengt WC = Water Content, percent ≘ = S	ar Strength (psf) ngth (ksf) h (psf)	LL = Liquid Lim PL = Plastic Lin PI = Plasticity Ir G = Grain Size C = Consolidati	nit ndex Analysis on Test
		in.)	ta di	<u> </u>				g				Laboratory Testing
Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value Casing	Blows	Elevation (ft.)	Graphic Log	Visual Descr	iption and Remarks		Results/ AASHTO and Unified Class
0					SS	SA		$\bowtie$	Boring probe. Fill spoils observed	on auger flights.		
- 5 - - 10 - - 15 -							257.9		Bottom of Exploration at REFUSAL. Concrete dust on auge	12.3 feet below ground r tip and bottom flight.	surface.	
25												
Rema		represen	t approximate bou	ndaries between soil types;	transitions ma	y be gra	adual.			Page 1 of 1		
			been made at tim	nes and under conditions states	ated. Groundw	ater fluo	ctuation	ns may oc	ccur due to conditions other	Borina No	.: BP-CLTS	-104

N	<b>Taine</b>	Depa	ırtment	of Transport	<b>Sportation</b> Project: Little Tomah Bridge #2472 carries Re over Little Tomah Stream					Boring No.:	BP-CLT	S-204
			Soil/Rock Exp JS CUSTOM	-		Loc			ittle Tomah Stream ville Township, Maine	WIN:	253	87.00
Drillin	na Cont	ractor:	S.W. Cole		Elevation	n (ft	`	269.5	3	Auger ID/OD:	5" Dia.	
Opera			Hanscom/Wal	1	Datum:	,,, (it.	· <i>)</i>	NAV		Sampler:	N/A	
<u> </u>	ed By:		N. Pukay		Rig Typ	e:			rich D-50	Hammer Wt./Fall:	N/A	
	Start/Fi		1/8/2024; 13:0	00-14:30	Drilling		od:		Stem Auger	Core Barrel:	N/A	
	g Locat		12+43.6, 7.2 f		Casing			N/A		Water Level*:	None Observe	d
Definition	ons: D =	Spilt Spoor			essful Thin Wa			e Attemp	ot WO1P = Weight of 1 Person S <sub>II</sub> = Peak/Remolded Field Vane Ur	drained Cheer Strangth (not)		
B = Bud MD = U U = Thi MV = U	cket Samp Insuccess in Wall Tul Insuccess	le off Auger ful Split Spo be Sample ful Field Var	Flights on Sample Atten ne Shear Test Att PP= Pocket Per	SSA = Solid : hpt	Stem Auger v Stem Auger		og.		Su − Pear/Reinfolder Iriel Valle United Shes qp = Unconfined Compressive Strer N-value = Raw Field SPT N-value T <sub>V</sub> = Pocket Torvane Shear Strengtl WC = Water Content, percent ≘ = S	ar Strength (psf) gth (ksf)	LL = Liquid Lim PL = Plastic Lir PI = Plasticity I G = Grain Size C = Consolidat	nit ndex Analysis
V	id varie o	nour root,		Sample Information	signit or reads o	Odolii	19		Wo = Water Content, percent = - c	Milliar of Equal too	O = Consolidat	
Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-value Casing	Blows	Elevation (ft.)	Graphic Log	Visual Descri	ption and Remarks		Laboratory Testing Results/ AASHTO and Unified Class.
0					SS				Boring probe. No material descript	ions.		
- 5 -												
- 15 -												
					, v		250.2		Dottom of Evulouation at	10.2 feet helesy ground a	19.3	
25									<b>Bottom of Exploration at</b> Auger REFUSAL, presumed bedro		ui iacc.	
Rema	irks:											
	mer #36									Done 4 of 4		
l .				ndaries between soil types;		-				Page 1 of 1		
		-	een made at tim ne measuremen	es and under conditions states were made.	ted. Groundwa	ater fluo	ctuations	s may oo	cur due to conditions other	Boring No.	: BP-CLTS	-204

# Appendix B

Rock Core Photographs



# MaineDOT Little Tomah Bridge #2472 Carries Route 6 Over Little Tomah Stream Codyville Township, ME

Rock Core Photographs

Boring No.	Run	Depth (ft)	Penetration (in)	Recovery (in)	RQD (in)	RQD (%)	Rock Type	Box Row	
BB-CLTS-102	R1	35.4-40.4	60	60	42	70	GRAYWACKE	1	
BB-CLTS-102	R2	40.4-45.4	60	60	50	83	GRAYWACKE	2	
BB-CLTS-101	R1	25.2-30.2	60	60	40	67	GRAYWACKE	3	



**Notes:** 1. "Box row" indicates the section of the box where the core run is contained: 1 = top, 4 = bottom.

2. Top of each core run is on the left and increases with depth to the right.



# MaineDOT Little Tomah Bridge #2472 Carries Route 6 Over Little Tomah Stream Codyville Township, ME

Rock Core Photographs

Boring No.	Run	Depth (ft)	Penetration (in)	Recovery (in) RQD (in)		RQD (%)	Rock Type	Box Row
BB-CLTS-201	R1	20.5-23.5	36	36	25	69	GRAYWACKE	1
BB-CLTS-201	R2	23.5-25.5	24	20	8	33	GRAYWACKE	1
BB-CLTS-202	R1	18.1-23.1	60	60	29	48	GRAYWACKE	2
BB-CLTS-202	R2	23.1-28.1	60	60	50	83	GRAYWACKE	3



**Notes:** 1. "Box row" indicates the section of the box where the core run is contained: 1 = top, 4 = bottom.

2. Top of each core run is on the left and increases with depth to the right.



# MaineDOT Little Tomah Bridge #2472 Carries Route 6 Over Little Tomah Stream Codyville Township, ME

Rock Core Photographs

Boring No.	Run	Depth (ft)	Penetration (in)	Recovery (in)	RQD (in)	RQD (%)	Rock Type	Box Row
BB-CLTS-203	R1	19.2-23.4	50.4	50.4	43	85	GRAYWACKE	1
BB-CLTS-203	R2	23.4-26.4	36	34	50	80	GRAYWACKE	2
BB-CLTS-203	R3	26.4-29.2	33.6	29	29	85	GRAYWACKE	3



**Notes:** 1. "Box row" indicates the section of the box where the core run is contained: 1 = top, 4 = bottom.

2. Top of each core run is on the left and increases with depth to the right.

## Appendix C

Laboratory Test Results

## State of Maine - Department of Transportation <u>Laboratory Testing Summary Sheet</u>

Town(s): Codyville Township Work Number: 25387.00

10011(3).	Cody	VIIIC	1 0 44113	<u> </u>	WOIK NUITIDE				. 23307.00			
Boring & Sample	Station	Offset	Depth	Reference	G.S.D.C.	W.C.	L.L.	P.I.	Cla	ssification	1	
Identification Number	(Feet)	(Feet)	(Feet)	Number	Sheet	%			Unified	AASHTO	Frost	
BB-CLTS-101, 1D	11+65.8	7.3 Lt.	5.0-7.0	337517	1	5.4			SW-SM	A-1-a	0	
BB-CLTS-101, 4D	11+65.8	7.3 Lt.	20.0-22.0	337518	1	8.5			GW-GM	A-1-a	0	
BB-CLTS-102, 1D	12+33.2	6.9 Rt.	5.0-7.0	337519	1	5.0			SM	A-1-b	ll l	
BB-CLTS-102, 2D	12+33.2	6.9 Rt.	10.0-12.0	337520	1	13.9			SC-SM	A-2-4	III	
BB-CLTS-102, 3D	12+33.2	6.9 Rt.	15.0-17.0	337521	1	33.9	N	Р	CL	A-4	IV	
BB-CLTS-102, 4D	12+33.2	6.9 Rt.	21.3-22.0	337522	1	14.1			SW-SM	A-1-b	0	
BB-CLTS-203, 3D	12+43.6	6.2 Lt	15.0-17.0	318503	pH 5.27			-	-			
BB-CLTS-203, 3D	12+43.6	6.2 Lt	15.0-17.0	318503	Electrica	al Resi	istivity	/ 1,86	34 ohm-c	m		
BB-CLTS-203, 3D	12+43.6	6.2 Lt	15.0-17.0	318503	Electrica	al Con	ductiv	ity 5	.36E-04 (	ohm-cm	)-1	
,								Γ				
		1										
		1			<u> </u>							
		<del>                                     </del>			<del>                                     </del>				<del>                                     </del>			
	<del> </del>	+			-		<b> </b>					
	1		<u> </u>									
	+	<del>                                     </del>			-				-			
		-			-			-	-			
	l	<u> </u>			<u> </u>							

Classification of these soil samples is in accordance with AASHTO Classification System M-145-40. This classification is followed by the "Frost Susceptibility Rating" from zero (non-frost susceptible) to Class IV (highly frost susceptible). The "Frost Susceptibility Rating" is based upon the MaineDOT and Corps of Engineers Classification Systems.

GSDC = Grain Size Distribution Curve as determined by AASHTO T 88-93 (1996) and/or ASTM D 422-63 (Reapproved 1998)

WC = water content as determined by AASHTO T 265-93 and/or ASTM D 2216-98

LL = Liquid limit as determined by AASHTO T 89-96 and/or ASTM D 4318-98 NP = Non Plastic

PI = Plasticity Index as determined by AASHTO 90-96 and/or ASTM D4318-98

#### Maine Department of Transportation Grain Size Distribution Curve SIEVE ANALYSIS HYDROMETER ANALYSIS US Standard Sieve Numbers Grain Diameter, mm 1/2" 3/8" 0.010 0.001 2" 1 1/2" 1" 3/4" #8 #10 #40 #60 #100 #200 0.05 0.03 100 0 10 90 80 20 Percent Retained by Weight 30 Percent Finer by Weight 50 60 30 70 20 80 10 90 100 2.36 2.00 76.2 12.7 9.53 6.35 4.75 0.075 0.005 100 10 0.1 0.01 0.001

### UNIFIED CLASSIFICATION

Grain Diameter, mm

SAND

	Boring/Sample No.	Station	Offset, ft	Depth, ft	Description	WC, %	LL	PL	PI
0	BB-CLTS-101/1D	11+65.8	7.3 LT	5.0-7.0	Gravelly SAND, trace silt.	5.4			
<b>♦</b>	BB-CLTS-101/4D	11+65.8	7.3 LT	20.0-22.0	GRAVEL, some sand, trace silt.	8.5			
	BB-CLTS-102/1D	12+33.2	6.9 RT	5.0-7.0	SAND, some gravel, little silt.	5			
	BB-CLTS-102/2D	12+33.2	6.9 RT	10.0-12.0	SAND, some silt, some gravel, trace clay.	13.9			
lack	BB-CLTS-102/3D	12+33.2	6.9 RT	15.0-17.0	SILT. some sand, trace clay, trace gravel.	33.9			NP
X	BB-CLTS-102/4D	12+33.2	6.9 RT	21.3-22.0	SAND, some gravel, little silt.	14.1			

GRAVEL

1
n
oy/Date
12/2/2022

CLAY

SILT



Client: Maine Department of Transportation

Project Name: Little Tomah Bridge #2471
Project Location: Codyville Township, ME

GTX #: 318503

Test Date: 02/05/24

Tested By: kgs Checked By: ank

## Laboratory pH of Soil by ASTM G51

Boring ID	Sample ID	Depth, ft	Description	Soil Temperature, ° C	Average pH Reading
CC-CLTS-203	3D	15-17	Moist, gray silt with gravel	21	5.27

Notes:



Client: Maine Department of Transportation Project: Little Tomah Bridge #2472 Location: Codyville Township, ME GTX#: 318503 Test Date: 02/06/24 Due Date: 02/09/24 Tested By: NMK Checked By:

## Laboratory Measurement of Soil Resistivity Using the Wenner Four-Electrode Method by ASTM G57 (Laboratory Measurement)

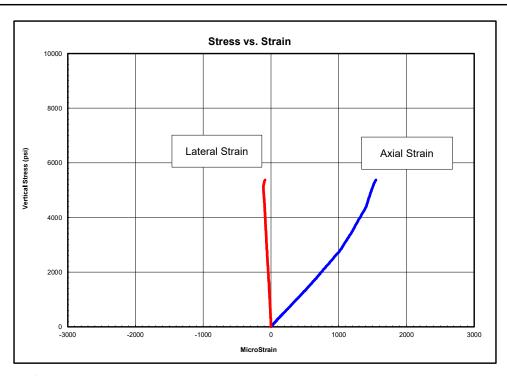
ank

Boring ID	Sample ID	Depth, ft.	Sample Description	Electrical Resistivity, ohm-cm	Electrical Conductivity, (ohm-cm) <sup>-1</sup>
BB_CLTS_ 203	3D	15-17 ft	Moist, gray silt with gravel	1,864	5.36E-04



Client: Maine Department of Transportation Project Name: Little Tomah Bridge #2472 Project Location: Codyville Township, ME GTX #: 318503 Test Date: 2/21/2024 Tested By: Checked By: Boring ID: BB-CLTS-202 Sample ID: Depth, ft: 21.52-21.87 Sample Type: rock core See photographs Sample Description: Intact material and discontinuity failure

# Compressive Strength and Elastic Moduli of Rock by ASTM D7012 - Method D



Peak Compressive Stress: 5,451 psi

Stress Range, psi	Young's Modulus, psi	Poisson's Ratio
500-2000	2,660,000	0.06
2000-3500	3,220,000	0.07
3500-4900	4,910,000	0.11

Notes:

Test specimen tested at the approximate as-received moisture content and at standard laboratory temperature.

The axial load was applied continuously at a stress rate that produced failure in a test time between 2 and 15 minutes.

Young's Modulus and Poisson's Ratio calculated using the tangent to the line in the stress range listed.

Calculations assume samples are isotropic, which is not necessarily the case.

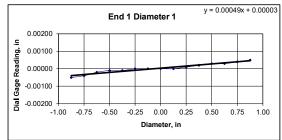


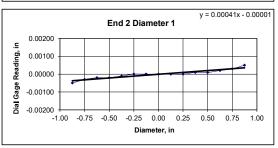
Client:	Maine Department of Transportation	Test Date:	2/19/2024
Project Name:	Little Tomah Bridge #2472	Tested By:	gp
Project Location:	Codyville Township, ME	Checked By:	smd
GTX #:	318503		
Boring ID:	BB-CLTS-202		
Sample ID:	R1		
Depth:	21.52-21.87 ft		
Visual Description:	See photographs		

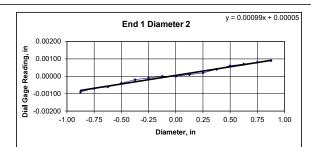
### UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

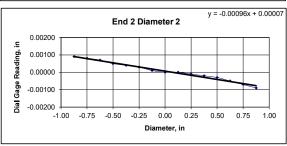
BULK DENSITY					DEVIATION FROM STRAIGHTNESS (Procedure S1)
	1	2	Average		
Specimen Length, in:	4.27	4.27	4.27		Maximum gap between side of core and reference surface plate:
Specimen Diameter, in:	1.97	1.97	1.97		Is the maximum gap ≤ 0.02 in.? YES
Specimen Mass, g:	591.94				
Bulk Density, lb/ft3	173	Minimum Diameter Tolerence N	4et?	YES	Maximum difference must be < 0.020 in.
Length to Diameter Ratio:	2.2	Length to Diameter Ratio Toler	ance Met?	YES	Straightness Tolerance Met? YES

END FLATNESS AND PARALL	ELISM (Proced	lure FP1)														
END 1	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875	
Diameter 1, in	-0.00050	-0.00040	-0.00020	-0.00010	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00010	0.00020	0.00030	0.00030	0.00040	0.00050	
Diameter 2, in (rotated 90°)	-0.00090	-0.00070	-0.00060	-0.00040	-0.00020	-0.00010	0.00000	0.00000	0.00010	0.00020	0.00040	0.00060	0.00070	0.00080	0.00090	
Difference between max and min readings, in:																
											0° =	0.00100	90° =	0.00180		
END 2	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875	
Diameter 1, in	-0.00050	-0.00030	-0.00020	-0.00020	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00010	0.00010	0.00020	0.00030	0.00050	
Diameter 2, in (rotated 90°)	0.00090	0.00080	0.00070	0.00050	0.00040	0.00030	0.00010	0.00000	0.00000	-0.00010	-0.00020	-0.00030	-0.00050	-0.00070	-0.00090	
											Difference between max and min readings, in:					
											0° =	0.001	90° =	0.0018		
1											Maximum difference must be $< 0.0020$ in. Difference = $+ 0.00090$					









crice mast be < 0.0020 m.	
Flatness Tolerance Met?	YES
Slope of Best Fit Line	0.00049
Angle of Best Fit Line:	0.02783
Slope of Best Fit Line	0.00041
Angle of Best Fit Line:	0.02357
lar Difference	0.00426
iai Dillerence.	0.00420
Parallelism Tolerance Met?	YES
Spherically Seated	
Slope of Best Fit Line	0.00099
Angle of Best Fit Line:	0.05664
Slope of Best Fit Line	0.00096
Angle of Best Fit Line:	0.05484
lar Difference:	0.00180
	YES
Spherically Seated	
	Slope of Best Fit Line Angle of Best Fit Line: Slope of Best Fit Line: Slope of Best Fit Line: lar Difference:  Parallelism Tolerance Met? Spherically Seated  Slope of Best Fit Line: Angle of Best Fit Line: Slope of Best Fit Line:

PERPENDICULARITY (Procedur	re P1) (Calculated from End Flatness	and Parallelism m	easurements a	bove)		
END 1	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?	Maximum angle of departure must be $\leq 0.25^{\circ}$
Diameter 1, in	0.00100	1.970	0.00051	0.029	YES	
Diameter 2, in (rotated 90°)	0.00180	1.970	0.00091	0.052	YES	Perpendicularity Tolerance Met? YES
END 2						
Diameter 1, in	0.00100	1.970	0.00051	0.029	YES	
Diameter 2, in (rotated 90°)	0.00180	1.970	0.00091	0.052	YES	



Client: Maine Department of Transportation Project Name: Little Tomah Bridge #2472 Project Location: Codyville Township, ME GTX #: 318503 Test Date: 2/21/2024 Tested By: te Checked By: smd Boring ID: BB-CLTS-202

Sample ID: R1
Depth, ft: 21.52-21.87



After cutting and grinding

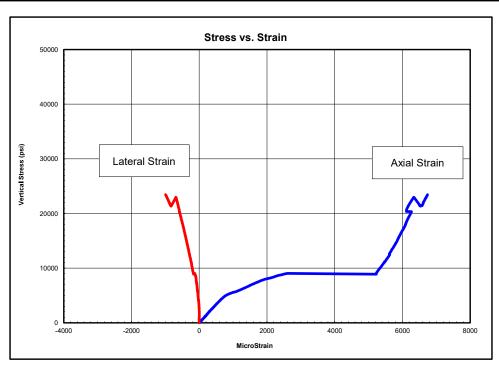


After break



Client:	Maine Department of Transportation
Project Name:	Little Tomah Bridge #2472
Project Location:	Codyville Township, ME
GTX #:	318503
Test Date:	2/21/2024
Tested By:	te
Checked By:	jsc
Boring ID:	BB-CLTS-203
Sample ID:	R1
Depth, ft:	19.25-19.62
Sample Type:	rock core
Sample Description:	See photographs Intact material failure
	Best Effort end preparation performed

# Compressive Strength and Elastic Moduli of Rock by ASTM D7012 - Method D



Peak Compressive Stress: 23,452 ps

An initial failure occurred after the first stress range. The data the strain gauges recorded until total failure is in the graph above but was not used to calculate Young's Modulus and Poisson's Ratio for the second and third stress ranges.

Stress Range, psi	Young's Modulus, psi	Poisson's Ratio
2300-8600	3,220,000	0.06
8600-14900		
14900-21100		

Notes:

Test specimen tested at the approximate as-received moisture content and at standard laboratory temperature.

The axial load was applied continuously at a stress rate that produced failure in a test time between 2 and 15 minutes.

Young's Modulus and Poisson's Ratio calculated using the tangent to the line in the stress range listed.

Calculations assume samples are isotropic, which is not necessarily the case.

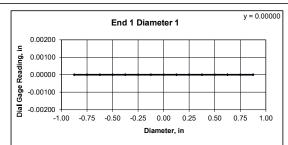


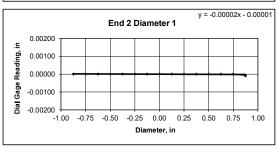
Client:	Maine Department of Transportation	Test Date: 2/19/2024	
Project Name:	Little Tomah Bridge #2472	Tested By: gp	
Project Location:	Codyville Township, ME	Checked By: smd	
GTX #:	318503		
Boring ID:	BB-CLTS-203		
Sample ID:	R1		
Depth:	19.25-19.62 ft		
Visual Description	See photographs		

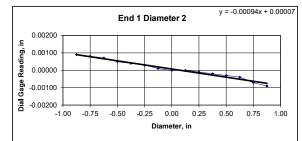
### UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

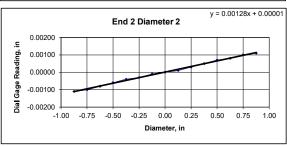
				DEVIATION FROM STRAIGHTNESS (Procedure S1)
1	2	Average		
4.22	4.22	4.22		Maximum gap between side of core and reference surface plate:
1.97	1.97	1.97		Is the maximum gap $\leq$ 0.02 in.?
575.55				
170	Minimum Diameter Tolerence	Met?	YES	Maximum difference must be $< 0.020$ in.
2.1	Length to Diameter Ratio Tole	erance Met?	YES	Straightness Tolerance Met? NO
	1.97 575.55	1.97 1.97 575.55 170 <b>Minimum Diameter Tolerence</b>	4.22     4.22     4.22       1.97     1.97     1.97       575.55     1.97     1.97	1.97 1.97 1.97 575.55 170 Minimum Diameter Tolerence Met? YES

END FLATNESS AND PARALL	ELISM (Proced	lure FP1)													
END 1	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Diameter 2, in (rotated 90°)	0.00090	0.00080	0.00070	0.00050	0.00040	0.00030	0.00010	0.00000	0.00000	-0.00010	-0.00020	-0.00030	-0.00040	-0.00070	-0.00090
											Difference between	en max and m	in readings, in:		
											0° =	0.00000	90° =	0.00180	
END 2	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00010
Diameter 2, in (rotated 90°)	-0.00110	-0.00100	-0.00080	-0.00060	-0.00040	-0.00030	-0.00010	0.00000	0.00010	0.00030	0.00050	0.00070	0.00080	0.00100	0.00110
											Difference between	en max and m	in readings, in:		
											0° =	0.0001	90° =	0.0022	
											Maximum differe	ence must be <	0.0020 in.	Difference = +	0.00110









DIAMETER 1		
End 1:	Slope of Best Fit Line Angle of Best Fit Line:	0.00000 0.00000
End 2:	Slope of Best Fit Line	0.00002 0.00115
Maximum Angi	ular Difference:	0.00115
	Parallelism Tolerance Met? Spherically Seated	YES
DIAMETER 2		
End 1:		
	Slope of Best Fit Line	0.00094 0.05402
End 2:	Slope of Best Fit Line Angle of Best Fit Line: Slope of Best Fit Line	
	Slope of Best Fit Line Angle of Best Fit Line: Slope of Best Fit Line	0.05402

Flatness Tolerance Met? NO

PERPENDICULARITY (Procedure	e P1) (Calculated from End Flatness	and Parallelism me	easurements a	bove)		
END 1	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?	Maximum angle of departure must be $\leq 0.25^{\circ}$
Diameter 1, in	0.00000	1.970	0.00000	0.000	YES	
Diameter 2, in (rotated 90°)	0.00180	1.970	0.00091	0.052	YES	Perpendicularity Tolerance Met? YES
END 2						
Diameter 1, in	0.00010	1.970	0.00005	0.003	YES	
Diameter 2, in (rotated 90°)	0.00220	1.970	0.00112	0.064	YES	



Test Date: Client: Maine Department of Transportation 2/19/2024 Project Name: Tested By: Little Tomah Bridge #2472 gp Project Location: Checked By: smd Codyville Township, ME GTX #: 318503 Boring ID: BB-CLTS-203 Reliable dial gauge measurements could not be performed on this rock type. Tolerance Sample ID: measurements were performed using a machinist Depth (ft): 19.25-19.62 straightedge and feeler gauges to ASTM Visual Description: See photographs specifications.

# BEST EFFORT END FLATNESS TOLERANCES OF ROCK CORE SPECIMENS TO ASTM D4543



Client: Maine Department of Transportation Project Name: Little Tomah Bridge #2472 Project Location: Codyville Township, ME GTX #: 318503 Test Date: 2/21/2024 Tested By: te Checked By: smd Boring ID: BB-CLTS-203

BB-CLTS-203 R1 19.25-19.62 ft

19 20 21 22 23 24 25 26 27 28 29 30 (c.m.) 3

8 9 10 11 12 (in.) 13

R1

19.25-19.62

Sample ID:

Depth, ft:

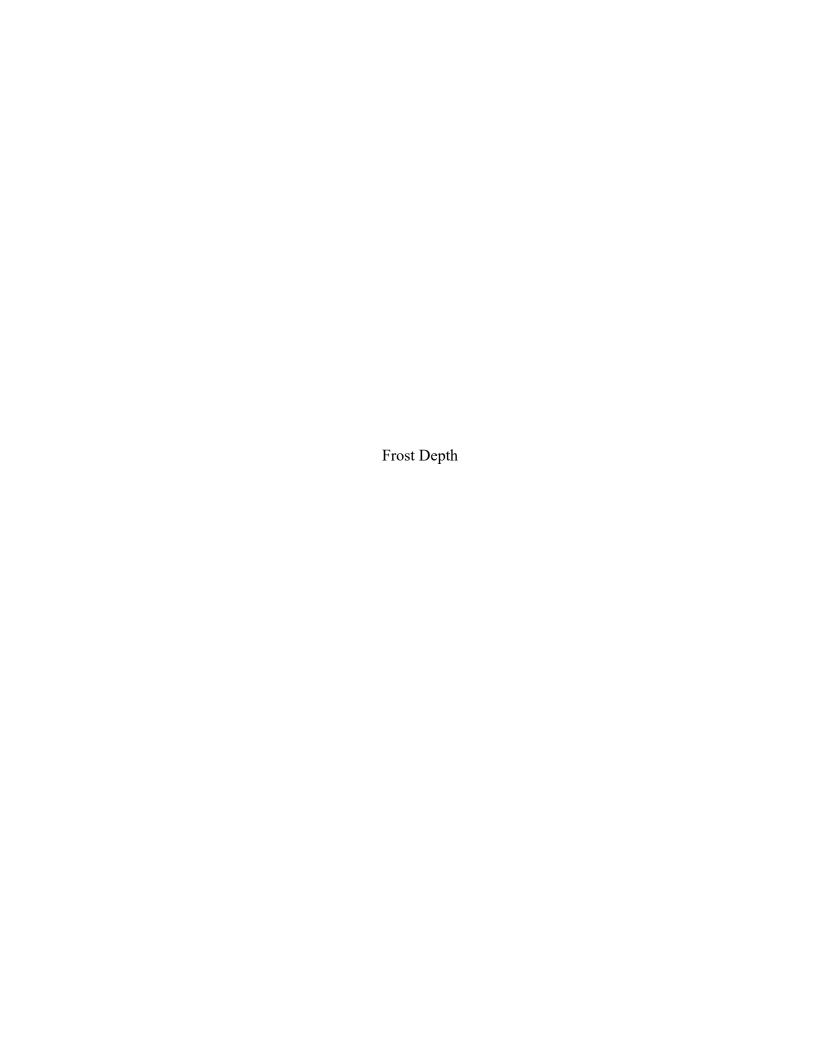
After cutting and grinding



After break

## Appendix D

Calculations



## Method 1 - MaineDOT Design Freezing Index (DFI) Map and Depth of Frost Penetration Table, BDG Section 5.2.1.

From Design Freezing Index Map: Codyville, Maine

DFI = 1850 degree-days.

Coarse-Grained Fill w=10% (BB-CLTS-101 1D, BB-CLTS-102 1D + 2D)

### **Coarse-Grained Fill**

For DFI = 1800, Coarse-Grained Soil, w=10%

$$DFI_1 := 1800$$
  $d_1 := 90.1in$ 

d=Depth of Frost Penetration

For DFI = 1900, Coarse-Grained Soil, w=10%

$$DFI_2 := 1900$$
  $d_2 := 92.6in$ 

Interpolate for DFI = 1850, Coarse-Grained Soil, w=10%

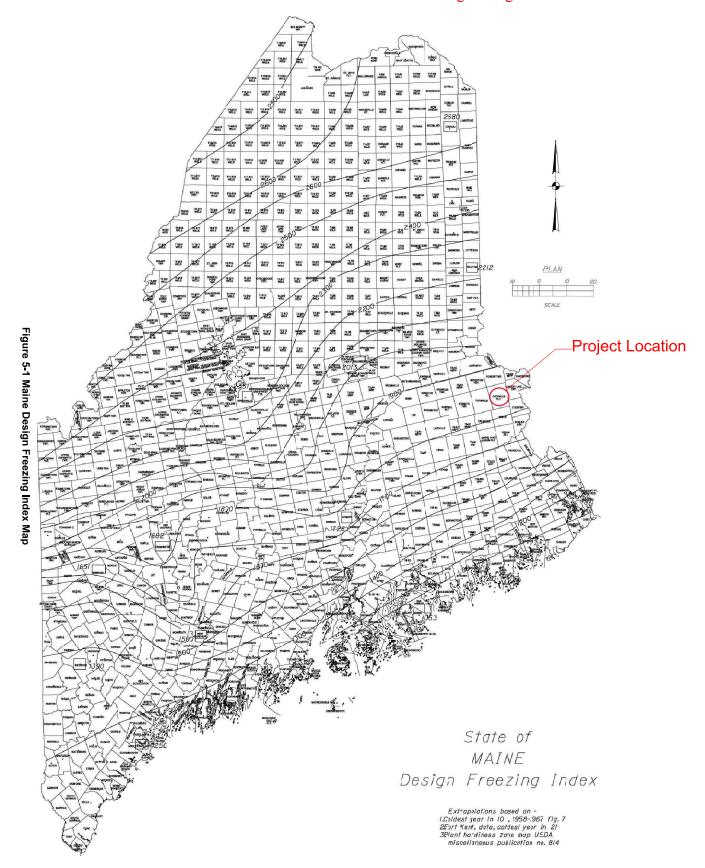
$$DFI_3 := 1850$$

$$d_{coarse} \coloneqq d_1 + \left(DFI_3 - DFI_1\right) \cdot \frac{\left(d_2 - d_1\right)}{\left(DFI_2 - DFI_1\right)}$$

$$d_{coarse} = 91.4 \cdot in$$
  $d_{coarse} = 7.6 \cdot ft$ 

Recommend any foundation bearing on soil be embedded 7.6 feet for frost protection.

### MaineDOT Bridge Design Guide



### 5.2 General

### MaineDOT Bridge Design Guide

### 5.2.1 Frost

Any foundation placed on seasonally frozen soils must be embedded below the depth of frost penetration to provide adequate frost protection and to minimize the potential for freeze/thaw movements. Fine-grained soils with low cohesion tend to be most frost susceptible. Soils containing a high percentage of particles smaller than the No. 200 sieve also tend to promote frost penetration.

In order to estimate the depth of frost penetration at a site, Table 5-1 has been developed using the Modified Berggren equation and Figure 5-1 Maine Design Freezing Index Map. The use of Table 5-1 assumes site specific, uniform soil conditions where the Geotechnical Designer has evaluated subsurface conditions. Coarse-grained soils are defined as soils with sand as the major constituent. Fine-grained soils are those having silt and/or clay as the major constituent. If the make-up of the soil is not easily discerned, consult the Geotechnical Designer for assistance. In the event that specific site soil conditions vary, the depth of frost penetration should be calculated by the Geotechnical Designer.

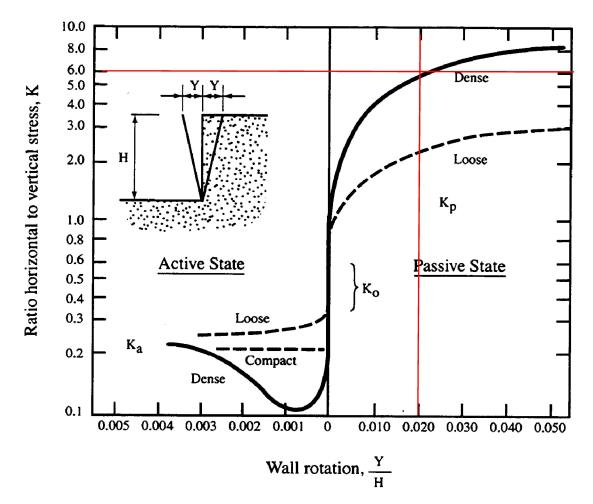
**Table 5-1 Depth of Frost Penetration** 

Design			Frost Pene	tration (in	)	·
Freezing	Co	arse Grair	red	F	ine Graine	d
Index	w=10%	w=20%	w=30%	w=10%	w=20%	w=30%
1000	66.3	55.0	47.5	47.1	40.7	36.9
1100	69.8	57.8	49.8	49.6	42.7	38.7
1200	73.1	60.4	52.0	51.9	44.7	40.5
1300	76.3	63.0	54.3	54.2	46.6	42.2
1400	79.2	65.5	56.4	56.3	48.5	43.9
1500	82.1	67.9	58.4	58.3	50.2	45.4
1600	84.8	70.2	60.3	60.2	51.9	46.9
1700	87.5	72.4	62:2	62.2	53.5	48.4
1800	90.1	74.5	64.0	64.0	55.1	49.8
1900	92.6	76.6	65.7	65.8	56.7	51.1
2000	95.1	78.7	67.5	67.6	58.2	52.5
2100	97.6	80.7	69.2	69.3	59.7	53.8
2200	100.0	82.6	70.8	71.0	61.1	55.1
2300	102.3	84.5	72.4	72.7	62.5	56.4
2400	104.6	86.4	74.0	74.3	63.9	57.6
2500	106.9	88.2	75.6	75.9	65.2	58.8
2600	109.1	89.9	77.1	77.5	66.5	60.0

March 2014 5-3

### Appendix E

References



Magnitude of Wall Rotation to Reach Failure

Soil type and	Rotation, Y/H				
condition	Active	Passive			
Dense cohesionless	0.001	0.02			
Loose cohesionless	0.004	0.06			
Stiff cohesive	0.010	0.02			
Soft cohesive	0.020	0.04			

Figure 10-4. Effect of wall movement on wall pressures (after Canadian Geotechnical Society, 1992).



allowed on the bridge before pouring the abutment diaphragm. In such cases, the Load Factors for Construction Loads shall be taken as per Article 3.4.2 of the AASHTO LRFD Bridge Design Specifications.

### 3.10.7 Superstructure Design Methodology

The connection between the beams and the abutment shall be assumed to be simply supported for superstructure design and analysis. It is recognized that, in some cases, it may be desirable to take advantage of the frame action in the superstructure design by assuming some degree of fixity. This, however, requires careful engineering judgment. Due to the uncertainty in the degree of fixity, frame action shall not be used to reduce design moments in the beams.

### 3.10.8 Pile Cap and Abutment Diaphragm Design

The superstructure is assumed to transfer moment, and vertical and horizontal forces due to all applicable loads, at the time when the rigid connection with the abutment is achieved. The effects of skew, curvature, thermal expansion of the superstructure, reveal, and grade are considered.

The design provisions below are conservative because the pile cap and the abutment diaphragm are very rigid members, therefore all loads shall be uniformly distributed across the abutment.

For the integral abutments constructed in two stages as specified above, the abutment shall be designed for the following two cases:

- 1. The pile cap is designed to resist all vertical loads including live load. It is assumed to act as a continuous beam supported by piles. The analysis can be simplified by assuming the pile cap acting as a simple span between piles and then taking 80% of simple span moments to account for continuity. Shears may be taken equal to simple span shears.
- 2. The entire abutment wall (the combined height of the pile cap and the abutment diaphragm) is designed to resist the earth pressure due to the backfill material, assuming the wall to act as a horizontal continuous beam supported on the girders, i.e., with spans equal to the girder spacing along the skew (if any).

The abutments should be kept as short as possible to reduce the magnitude of soil pressure developed. A minimum of 3'-0" for inspection access shall be provided. A minimum fill cover over the bottom of the abutment of 3'-0" is desirable. It is recommended to have abutments of equal height due to the fact that a difference in abutment heights causes more movements to take place at the shorter abutment. Abutments of unequal height shall be designed by balancing the earth pressure consistent with the magnitude of the displacement at each abutment.

The magnitude of lateral earth pressure developed by the backfill is dependent on the relative wall displacement,  $\delta_T/H$ , and may be considered to develop between full passive and at-rest earth pressure. The backfill force shall be determined based on the movement-dependent coefficient of earth pressure (K). Results from full scale wall tests performed by UMASS<sup>[1]</sup> show reasonable agreement between the predicted average passive earth pressure response of MassDOT's standard compacted gravel borrow and the curves of K versus  $\delta_T/H$  for dense sand found in design manuals DM-7<sup>[2]</sup> and NCHRP<sup>[3]</sup>. For the design of integral abutments, the coefficient of horizontal earth pressure when

using compacted gravel borrow backfill shall be estimated using the equation:

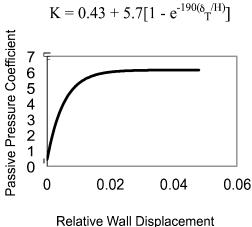


Figure 3.10.8-1: Plot of Passive Pressure Coefficient, K, vs. Relative Wall Displacement,  $\delta_T/H$ .

The simplified approach may be used to calculate moments and shears in the abutment walls, assuming the abutment wall acting as a simple span between piles and then taking 80% of simple span moments to account for continuity. Shears may be taken equal to simple span shears. Due to the relatively large dimensions of the abutment walls, minimum reinforcement is usually sufficient to satisfy the strength requirements.

The longitudinal reinforcement of the pile cap shown in Chapter 12 of Part II of this Bridge Manual represents an upper-bound for the required reinforcement assuming the girders are located at the positions that produce maximum effects on the pile cap and assuming a conservative value of other dead loads on the abutment wall.

Stirrups intended to resist horizontal shear forces acting on the pile cap due to soil passive pressure shall be provided as shown in Part II of this Bridge Manual.

L-shaped connection reinforcing bars indicated in the standard drawings of Chapter 12 of Part II and Chapter 2 of Part III of this Bridge Manual shall be provided to transfer the maximum expected connection moment between the abutment and the superstructure. These bars shall be #6 @ 9" for girders up to 8 feet deep. For deeper girders they shall be designed. The vertical leg of the connection bars shall be placed as close as practical to the back face of the abutment. The horizontal leg shall be extended into the deck beyond the inside face of the abutment diaphragm at the elevation of the deck top longitudinal reinforcement for a length equal to 10% of the span plus the development length, for simple span bridges. For continuous span bridges the bars shall be extended to 10% of the end span plus the development length.

Refer to Chapter 12 of Part II and Chapter 2 of Part III of this Manual for more information on the integral abutment reinforcement.